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ABSTRACT

This issue addresses (1) growing international interest in learning environments and their effects on behavior, and (2) design education, an integrated model for visual-spatial lifelong learning. It focuses on this new and emerging integrated field which integrates elements in education, new learning environment design, and the use of more two- and three-dimensional visual thinking as mainstream educational practices. Following an editorial introduction, the issue's articles are: (1) "Technology and Education" (George Lucas); (2) "Learning Is Being Alive" (Rina Swentzel); (3) "E Pluribus Unum: The New American Community School" (Steven Bingler); (4) "Environments for Children" (Dolf Schnebli); (5) "Beauty, Morality, Sunshine and Freedom" (George Anselevicius); (6) "A Case History of a Community School in Sendai, Japan" (Hiroko Hosoda); (7) "Lessons in High School Planning and Design" (C. William Brubaker); (8) "Ecology and Community" (Fritjof Capra); (9) "The Role of Designers in Design and Education" (Peter Edward Lowe and Phillip I. Nobel); and (10) "Physical Environments Do Affect Learning and Behavior of Students" (Anne Taylor). (Contains 23 references and a list of resources for learning environment design.) (EV)

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VOLUME XI

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Mass Magazine - Fall 1998

Architecture and Children
Learning Environments and Design Education

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and former Dean
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Editorial Introduction

Architecture and Children: Design of Learning Environments and Design Education for a new generation.

Fall 1998

This issue of MASS magazine, Architecture and Children, addresses growing international interest in learning environments and their effects on behavior as well as Design Education, an integrated model for visual - spatial lifelong learning.

In 1993 the University of New Mexico School of Architecture and Planning sponsored the first International Summit on Architecture, Design and Design Education for Children as a theme.

Jonas Salk was the conference keynote speaker reacting to a panel on the topic of creativity and the need to promote creative behavior as a critical path to the future in all fields. His presence was especially treasured since he is now deceased.

Participants from the US, Japan, Finland, Canada and France were immersed in three days of seminars addressing the design of more imaginative learning environments for the future. Speakers envisioned classrooms as interactive electronic studios, outdoor ecological study areas, museums, life long learning communities totally transformed from our present image of a "school." Architecture is not a passive series of vacuous spaces but becomes a "three dimensional textbook" with developmental needs and the curriculum concepts to be learned as the criteria for design. Design Education programs were cited as important for students to visualize the design of their own schools such as has occurred in Stockton, California. Architects such as Steven Bingler, George Vlastos, Dale Lang, Paolo Soleri shared their insights including the concept of no building of new facilities and using other buildings which already exist in communities.

Because we are a materialistic society, design education is becoming more and more important to educators and students as a way of making education *project based, applied and "real"*! There is a growing interest in design education (also called built environment education) fostered by the American Institute of Architects and more recently by the Association for Industrial Designers, the National Art Education Association and general math science educators. Design educators advocate the use of visual-verbal journals, model building, integrated learning, instant photography, teaching of structures, simple computer aided design (CAD), rural and urban planning, studio and electronic learning communities, historic preservation, local historic walking tours. This type of education promotes visual awareness and literacy, cultural pluralism and global understanding of diverse environments, design in nature, landscape design and eco-literacy.

Perhaps the most valuable lesson learned by the summit participants is the growing interest in marrying two discrete disciplines - ARCHITECTURE AND EDUCATION. It seems imperative that architects, and those in architectural education, realize the importance of the role of architecture and the studio design model as a way to restructure education. Colleges of education need to include this kind of thinking in their programs.

The long range benefit of design education is an informed citizenry equipped with skills and values to help cities , towns, and rural areas grow into better places to live. No single state in the United States includes specific knowledge of Architecture in its curriculum mandates.

Such Institutes as the University of New Mexico School of Architecture and Planning's Institute for Environmental Education, the Center for Eco-Literacy at Berkeley and its affiliates, the newly-formed Thomas Jefferson Institute for Design in Education at the University of Virginia, Pomona College's degree program in Creativity (Doreen Nelson) and the University of Washington's Center for Environmental Design and Education pave the way to an increased merging of both architecture and education departments.

This issue of MASS Magazine is written to focus on this new and emerging integrated field which at long last integrates elements in education, new learning environment design and the use of more two and

three dimensional visual thinking as main stream educational practices.

George Lucas, director of the George Lucas Foundation in Networking in the Schools gives us a strong challenge to transform school environments and to promote creative endeavors and new ways of teaching and learning through technology.

Rina Swentzell, PhD., a Native American graduate of the School of Architecture and Planning and the American Studies department at the University of New Mexico, recalls a childhood where education was organic in the context of a real world learning environment in contrast to an artificially imposed Bureau of Indian Affairs classroom model of learning.

Steven Bingler, Concordia Architects of New Orleans, proposes the planning by and use of the total community as a broad learning environment.

Dolf Schnebli, Architect, of Switzerland, relates his experiences in designing for children, noting that what we design for children, if it is well done, can be beneficial to adults too.

George Anselvicius, FAIA, Professor Emeritus and former Dean of the School of Architecture and Planning at the University of New Mexico, reviews the history of school design while calling for beauty, morality, sunshine and a return to freedom in school design.

Hiroka Hosada, Architect, Director of the Architecture and Children Network Sendai Japan, relates the case study of a school destroyed during World War II and was rebuilt twice as a vital community school, something American communities are just beginning to think about. She was the project architect for the school.

Bill Bubaker, FAIA, considered one of the "fathers" of modern school architecture collaborated over 50 years ago with Eero Sarranen on a still vital campus, the Crow Island School in Winnetka, Illinois. He reviews some of the history of school design of his firm, Perkins and Will, in Chicago, and their contribution to the evolution of modern school design.

As we move to address the importance of built and natural environmental design education, Fritjof Capra, philosopher, physicist and author of The Web of Life (1996), gives a strong argument for emphasizing systems and ecological thinking as a change agent for a new educational model which demands certainly, the restructuring of environments in which learning occurs. Capra heads the Center for Eco-literacy, Berkley.

Peter Lowe, Executive Director of the Worldesign Foundation and Phillip Nobel, New York based designer and author, write about the benefits of "design thinking" — the innate thought process used to solve complex material problems. Lowe's organization is strongly promoting design education as a part of all teacher education, something now missing in the curricula of Colleges of Education in America and elsewhere.

Anne Taylor, Hon. AIA, Director of the Institute for Environmental Education at the School of Architecture and Planning University of New Mexico, reviews some of the research on the effects of the environment on learning and behavior and offers a model for the programming of educational spaces as a "three dimensional text book" based on developmental needs, curriculum and the instructional delivery system.

It has been a pleasure to be the editor of this proactive issue of MASS magazine which heretofore has only addressed issues affecting adults in architecture and urban planning. Since children are our future, we must rethink the American school and the way we educate our young. Perhaps as we continue to spend billions of dollars on new and retrofitted schools, architects, designers and educators will talk more to each other and to students to bring newer and more creative - aesthetic designs to communities everywhere.

Technology and Education

George Lucas

In the old days, movies were made in very different ways than they are today—most were shot on location, needed a huge cast to portray crowd scenes, and did not incorporate anything but what the eye of the camera could capture. Today, with the advent of digital technology, filming has forever moved out of the Industrial Age and continues to evolve to keep pace with rapidly-changing technologies and techniques.

To accommodate these dynamic shifts in filmmaking, I built a post-production facility that supports the creative processes of today and can be adapted to the demands of tomorrow. The baseboards and panels in the floors are removable to allow easy access to the wiring. The recording stage has walls that can be rearranged to produce the highest quality sound. In designing this building, my goal was to create an environment that is ideally suited to support the creative work that needs to take place there, and which can evolve as the nature of the work changes.

Creative Learning Systems

What does all of this have to do with education? If we are going to transform education, so too must we transform school facilities. They need to be flexible and adapt to the changing nature of teaching and learning. I am excited when I hear about some of the new schools being built that reflect the importance of an environment in supporting creative endeavors and new ways of teaching and learning. These dynamic and versatile schools enable learners to actively pursue information and learn in a variety of ways. The spaces support student and teacher inquiry through both the latest technologies and hands-on learning. Places for group activities as well as smaller areas for individual work and study have been built, and the technological infrastructure provides interactive multimedia and telecommunications technologies throughout. Unfortunately, nearly one in three of the over 100,000 school facilities nationwide are either unsafe or unsuitable for learning. Inadequate space and limited technological infrastructure are far too common. A recent survey conducted by the National Center for Education Statistics, of 917 schools nationwide found that only 9% of classrooms have access to the Internet, and of these, minority and low-income children are less likely to have access than their wealthier counterparts. The good news is our national leaders are paying more attention to this issue and calling for every classroom to be wired. The bad news is that students and teachers are still isolated in schools everywhere and don't have access to the resources that we know are essential for an effective education.

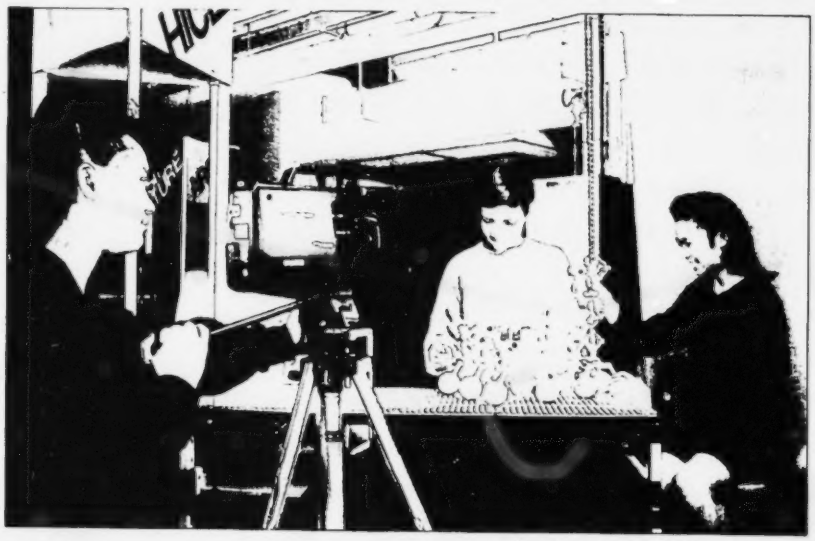
Creative Learning Systems

Creative Learning Systems

The challenge for education is to ignite a passion for learning and provide places that can help keep it strong throughout a lifetime. If we have a commitment to our children and a vision of what exciting and appropriate educational environments could be like, then we can do nothing less but create the best schools.

Education is an investment, and it is something that demands our undying commitment and sustained support. Our country and the world will reap huge dividends if we take the time now to provide our students and teachers with the resources they need. Our children are our future, and teachers are the explorers who will help chart the course. They deserve all the best we can give them, and we owe them nothing less.

Editor's Note:
Since the inception of this journal George Lucas and the Lucas Foundation have generated a book and video film on Learning Environments entitled, Learn And Live.



Creative Learning Systems

Learning is Being Alive

Rina Swentzell

Sensuality is a primary feeling of my childhood days at Santa Clara Pueblo. Pushing my toes into the mud and squishing up the gooey stuff through my toes is an intensely familiar feeling. As I did that, my brown skin melted into the color of the mud. I was the same— the mud, the earth, and me. Later I would walk in the stream of water that flowed down from the mountains and feel the small pebbles between my toes while searching for the larger, caressing cobblestones to massage the undersides

Nueva Day School

of my feet. Meanwhile, I would watch and talk with the enormous billowing clouds which formed overhead. They were relatives— great-grandmother, father, aunts and uncles.

That world was comfortable and secure. It contained me—us. As children, we roamed in the fields and nearby hills. We learned an intimacy with the plants, rabbits, rocks and clouds. We belonged. We learned. Learning happened naturally. We breathed, we were alive, therefore, we were learning. "Ha-pu-weh" is the Tewa word for learning. The literal translation is "to have breath" which also means "life".

We learned about the world that we lived in by being a part of it, by being in it. We learned to build houses. We mixed the mud for the bricks, mortar and plaster by squashing it under our feet and between our toes. We played while working, while mixing the mud. We carried the dried adobe bricks tight against our bodies, feeling their overwhelming weight and tenuousness as they often broke in our arms crushing our bare toes. We carried our pails of the brown mud to dump on the walls for mortar. We stacked the bricks staggering the lines so the wall was strong. Later, we watched the men carry the logs and place them over the walls. We ran underneath the new shade of the roof and reveled in our creation.

In that world, learning was about being alive but being alive was about creating. It was known that every being is creative. Every person, woman, child and man, was a creator. We made our own shoes, clothes, pots, houses. There were no specialists, no experts because everyone did whatever there was to do in his or her own way. The important thing was that everyone was honored for what he/she could and did do.

When I was six, I began school. The Bureau of Indian Affairs (BIA) school at Santa Clara Pueblo was a close walking distance to the community yet it was separate. It was fenced-in. The cattle guards and the double-stiled ladders built over the fence were the only openings into the compound. They kept out animals and old people. All large rocks, trees and shrubs were scraped away. Metal swings and slides took their place.

Furawasa

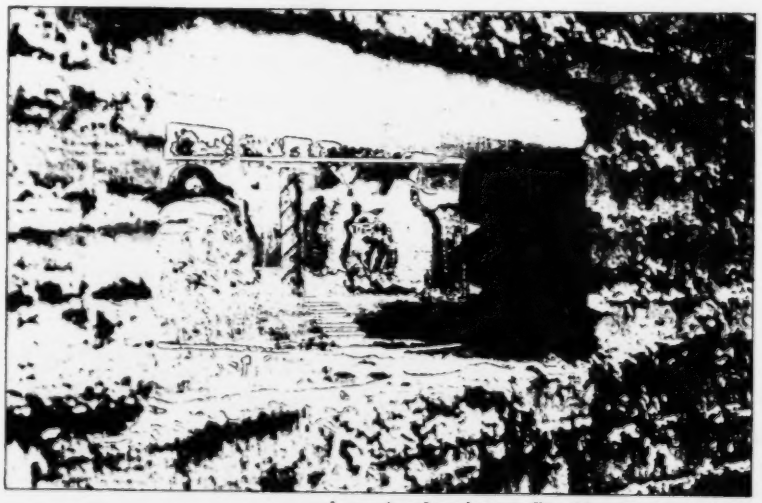
Within the school building, we were grouped into rooms according to grade level. Inside the various classrooms, the divisions continued. Those who could read well were separated from those who couldn't. Older children could not work or play with younger children. Individual desks and mats were assigned.

Individual achievement was praised. We had to work against each other. The teacher praised those who were better than others. She had the only legitimate voice. This voice told us what was acceptable and what was not.

Nothing seemed to flow naturally. As the community spaces abruptly stopped at the fence, so were human activities parceled out and clearly defined. We were told when to play, read, add, subtract, eat, sleep and talk. Things did not go together. We were told what, when and how to learn. We were not treated as creative, capable and active human beings who could contribute.

The BIA school was an extension of a foreign world, a foreign way, which had come to change our world. It opposed our world and everything about it. We were considered dirty and uncivilized. There was no appreciation for us, our ways and our place. The school was part of a world that embraced future orientation, time assignments, specialized buildings, artificial playgrounds and passive learning.

Today, I can look back and see that the BIA school at Santa Clara was very typical of American schools. It was isolated from the community. It was authoritative, hierarchical and non-sensual. Our aunts and uncles in the clouds couldn't see what we were doing inside those straight-walled buildings. How could we talk to them? We had to keep our toes clean of dirty mud and wear stiff shoes. How could we feel the earth? How could we be creative if we couldn't feel the mother, the source of life, the source of creation, under our feet? How could we learn if we couldn't touch, do, feel, and breathe in our oneness with life?



Learning Landscape Zia Elementary School

E PLURIBUS UNUM

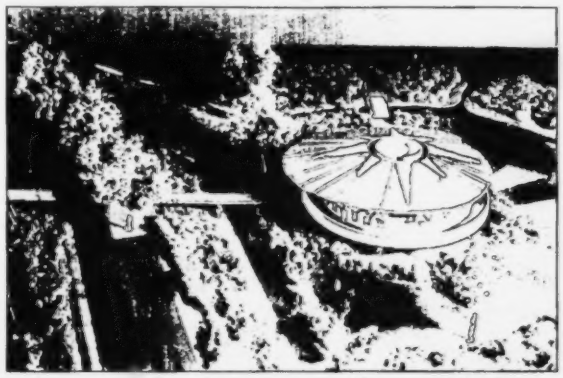
The New American Community School

Steven Bingler

Much of the twentieth century has been characterized by a forceful tendency towards disintegration and diffusion. The design and construction of buildings, a practice that was once accomplished by a master builder and a collaborative team of talented journeymen, now includes a legion of architects, engineers, general contractors, construction managers, electricians, plumbers, mechanics, and attorneys, along with a host of support agencies and institutions. The manufacturing of automobiles, which was once handled by teams of generalists in the fields of procurement, machining and assembly has grown over the past 50 years to encompass more than 2000 independent disciplines. In less than a century, the medical profession has expanded to more than 59 primary specialties and numerous sub-specialties. In education, the delivery of knowledge, which was once conducted in one room schools with an educator generalist now includes multiple specialists in all core subjects as well as early childhood, special education, art, athletics, vocational education, assessment, governance, counseling, administration and transportation. Although it is difficult to argue with the benefits of exploring and expanding one's field of endeavor, it is also important to recognize the need to understand how this extended kit of parts still fits together as a whole. In order to avoid problems of coordination and communication among the vastly expanding information resources now available, a better knowledge of the operation of these more complex systems is now required. We need to look at the forest as well as the trees.

This paper explores an emerging trend toward integration and inclusion that provides the ground work for addressing some of these concerns. Although the emphasis here is on the impact of this trend on education, it is important to note that our view of the learning environment must be expanded to include the entire community and all of its related parts. For this reason, it is not enough to think about the design of educational environments in and of themselves, but to adopt an approach to education and educational facilities planning that is more integrated with the planning of the total urban and community environment.

Over the past twenty years, the rocky road of educational reform has evolved toward an ethic that embodies more inclusion and integration. Teachers



Concordia Architects

are becoming more team oriented. The relationships between students are becoming more cooperative. Special needs kids are being incorporated into the mainstream, and in some ways, as has been identified by Howard Gardner, every student is considered to have unique "intelligences" or learning abilities. Curriculum is evolving towards a set of frameworks that are interdisciplinary, hands-on and integrated with the real world. This kind of integrative thinking, when combined with the powerful advances in specialization that proceeded it, presents one of the great opportunities for the advancement of education in our time. As expressed through recent explorations of ecological processes (Capra) and systemic thinking (Senge, Wheatly) it is a kind of healing process that breaths new life into complex organizations.

Some of these integrative ideas are beginning to find their way into a discourse about a total learning environment that, for once, embraces all of the factors that influence how and whether powerful learning is actually taking place. As the dialogue continues to expand, its logical resting place will be in the environment on which learning has always been most dependent, the environment of the total community. Dr. Leonard Duhl, the father of the international "Healthy Cities" movement, has advocated such a focus for over 30 years. Duhl's point of view is that communities function much like

Wolff, Lange, Christopher / Concordia

a human body, where an illness in any vital organ significantly and sometimes radically affects the health and well being of the whole body system. Likewise in communities, a single malfunctioning part can seriously inflict or incapacitate the whole community system. Since education is a complex interdependent assemblage that impacts on, and is impacted by all of the community's individual parts, it is here that a healthy and fully functioning system is most critical for long term community stability and sustainabilty. In order to explore this integrated community framework better, it is helpful to consolidate some of its myriad components into a manageable set of interdependent environments.The first of these inter-dependent environments includes all of the community's **physical** resources. This category encompasses the total built environment, including buildings, bridges, highways and even telecommunications infrastructure. Also included is the natural environment, which encompasses parks, recreation areas and streams.

The second inter-dependent environment encompasses all of the community's **learning** resources. Included in this category are Pre-K to 12, community college and university curriculum. The comprehensive community learning environment also includes all civil service training and skills development programs along with similar programs in the corporate/private sectors.

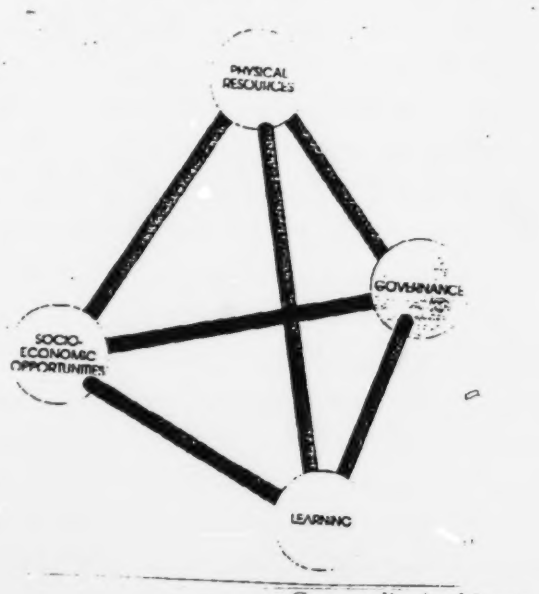
The third environment defines the community's various systems of **governance**. Included are the organizational structures of school boards, city and county boards of supervisors and civic organizations. This category defines how and by whom decisions made on the part of the total community are developed, deliberated and implemented.

The fourth environment includes the **social and economic** programs that impact on the individual and collective well being of the community. These include a broad range of programs related to business and commerce as well as health and human services.

These four environments comprise some of the essential elements of the total community environment. Although the wealth of individual community resources that they contain are

TETRAHEDRON

The tetrahedron is used to symbolize strong community learning environment connections



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necessary components of every community, it is the **quality of their interaction** that determines the community's ultimate health and well being. These interdependent connections can be visualized as a tetrahedron. Here, the four individual components of the community environment are represented by four small spheres. Each of these environmental components interact with the other three. Together, this produces a total of twelve interdependent interactions. The relationship between all of these environmental parts and the whole tetrahedron are also interdependent. Together, they describe the living **culture** of the community organization, which lies at the center of well being for the community as a whole.

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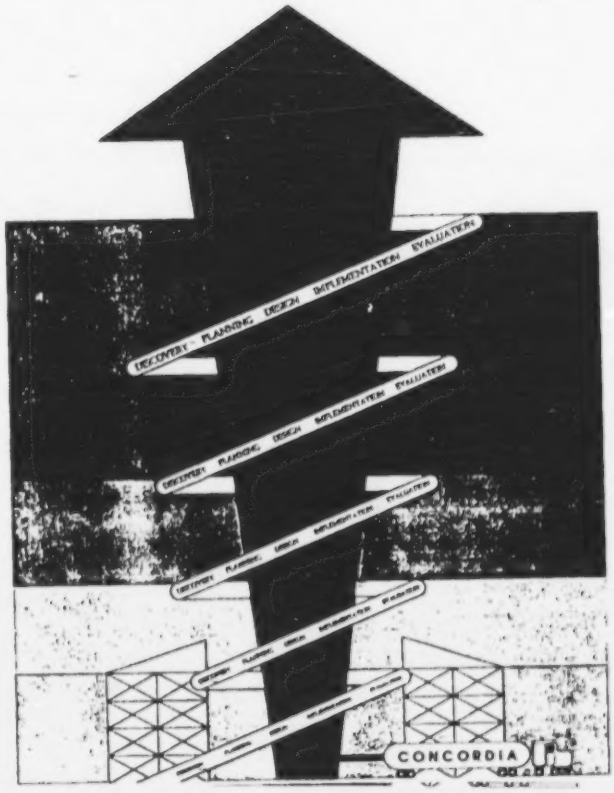
An integrated vision, which is unique for every community, is derived from the geographic, historic, ethnic, social, economic, educational and cultural factors that distinguish one community organization from another. Any creative process that allows for the discovery, celebration and incorporation of these diverse influences must be in tune with the heartbeat of the community organism. In this context, our current community malaise can be seen as the product of a congenital disease that blocks the flow of living information between each of the community's vital organs. Restoring these vital communication channels takes hard work and a lot of patience. When the system is functioning to its maximum advantage, the parts depend on the whole and the whole relies on all of its parts working together harmoniously. Out of many, one...*E pluribus Unum.*

A good starting point for the development of more harmonious community systems lies in the educational sector. The importance of schools to local economies has been demonstrated through the choices made by businesses and families when they analyze strategic investments or future locations. Education impacts on all aspects of life and every person in the community is at some time a participant in the educational process. It is through this shared, educational experience that the community can most easily find its common ground. Achieving the collective vision, designing a plan for implementation and carrying through with a systemic plan requires careful orchestration and facilitation. Included in the process must be a broad range of community stakeholders, including students, parents, educators and representatives from business and civic organizations.

Two planning projects facilitated by Concordia Incorporated include integrated planning principles that address these goals. The first project, a plan for the Lincoln Unified School District in Stockton, California, began with the design for a new high school facility. With the help of 100 community stakeholders, the process led to the development of a restructuring plan for the district called "The Lincoln Plan". Included in the long range plan is a



Concordia Architects

design for a 40 acre integrated learning center with an environmental research facility, a business/ conference center and physical fitness center developed through a cooperative school-community model. A second project for the Western Placer School District in Lincoln, California developed by a similar set of stakeholders resulted in a master plan for the entire school district that encourages school-community partnerships and cooperative public/ private funding for all future educational facilities.

A community-wide interdependent learning environment that is developed and sustained by its constituents is the foundation for the continued evolution of the ideals of the American Democratic vision. Combined with the vast resources of information and knowledge developed though the proliferation of individual disciplines, there exists an unprecedented opportunity for a New American Community School that can foster the ongoing expansion of the collective human spirit.

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Environments For Children

Dolf Schnebli Architect

My thoughts on what makes a good environment for children come from my work as an architect: with each design the architect reshapes a small piece of the total environment. There was a time when architects—maybe even more so their critics—were more interested in the perfect proportioning of an elevation or the harmonious massing of a whole building than in the fitting of the building into its surroundings. The rapid growth of cities made it obvious that buildings, or better how buildings are used by people, greatly influence the whole environment. Wherever a building is inserted, whether it is into untouched nature, a suburb or a city, the building and the activities it shelters themselves become active parts of the environment. The growing awareness that architecture is socially meaningful only if it is considered a part of the man-made landscape, explains why increasingly more architects became interested in city and regional planning. Since the early 1950's everywhere in the so-called civilized world more and more people have become aware that it is not enough to find some order in the three-dimensional design of our environment. Much graver than the visual disorder is the damage that has been done to the ecological order. To find solutions to the problems of soil, water, and air pollution, common action by people and countries is needed. The lack of common goals, the exaggerated reliance in our Western world on private enterprise and on the whole, a displaced set of values have brought about the pollution of our environment. The lamentable visual chaos is just an expression of a much deeper underlying disorder. Now that maps of the Mediterranean are being published in popular magazines, indicating the polluted beaches that are unsafe for swimming, one can hope that the public consciousness is sufficiently aroused to make pollution more than a convenient political issue. Perhaps the sheer size of the problems to be solved through common action may show man once again that our common goods are much more important than private property.

Children inevitably inherit their world from adults, and it seems to me that the one we leave to them today is rather messy. I fully understand the young students in architectural schools who, before getting involved in designing buildings, want to change the society which brought about the chaos we are faced with today. But the value systems of societies do not change that fast, and in the meantime buildings are constructed, cities grow, and people are born and die. As a citizen, one has to be politically engaged in changing the values of our society. As an architect, or in any other capacity connected with the planning or construction of a new building, one has to make a conscious effort to effectively put in order that little piece of built environment in which one is actively involved.

Dolf Schnebli

It is difficult to single out "the environment for children." Eventually I would like to show as examples some aspects of a kindergarten and several schools designed as just such environments.

But before going to these rather special buildings, let us look at some elements in daily life that seem to make up a child's surroundings.

In designing a school or kindergarten these elements are constantly in the back of the designer's mind. Playing by a brook, scrambling up a tree, clowning with grown-ups, finding complete understanding with a dog or cat, exploring the magic of a city neighborhood, are all activities through which children take possession of an environment and, at the same time, through their attitude transform it into a world for themselves. But just as such an environment can be destroyed by the words of an unimaginative adult, so it can be created by the gesture or the word of an adult who still has a bit of the world of children in him. We forget too easily that formal schooling is a rather recent invention.

On a trip through the Middle East I had occasion to live for some time with nomad tribes of Afghanistan. The children there grow up with the adults and learn their trade directly from their mothers and fathers. Play and work, teaching and learning, form one integrated process. Observing the playfulness of the whole process, I got the impression that a child was never treated as someone who is being prepared for a future role, but that the grown-ups as well as the children just live each according to his own age. It is obvious that it would be difficult to send the children with their fathers to our office buildings and factories and hope that they would learn anything about their elders' work. Probably the activities most adults are engaged in to earn their living are too complex and at the same time too specialized to be absorbed by a child, but on the other hand there may still be many basic things children could assimilate through direct, involved contact with adults in such a way as to be better prepared for their complex future tasks, even to the extent where they would be capable of better understanding and simplifying these tasks.

Of course, I do not propose that in order to create a good environment for children we should go back to the life of biblical times. There would certainly be serious arguments to show that in many respects today we would have better means for creating a far superior environment for more children than ever before. It seems probable that the greater loving care given to children in more primitive societies was necessary for sheer survival. Because of the many

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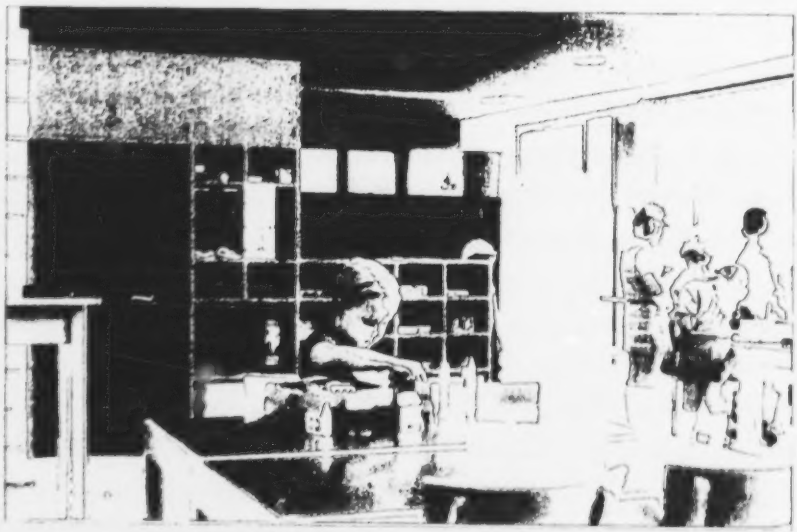
services available today, such as medical care and professional childcare, it may seem less necessary for a child to receive from birth the love and warmth of his mother. Physical survival is more possible than at any time, but I am not sure about mental survival.

Walking through our "highly civilized cities," I all too often encounter dead souls in living bodies. A good environment for children starts with the "nest warmth." The necessity to be loved and cared for by other human beings seems to accompany man though out his life. Because this necessity is felt most strongly by the weak—by children and old people—one can explain the mutual love between little children and the elderly. The self-reliance of the most active generation may explain why so many values dear to children and to the elderly are so often neglected in our society. For the child to step out of his known environment is a great adventure. I think joy and fear are closely linked: the unknown is tempting when a safe retreat to the familiar is granted. The two children on their blanket with the Teddy bear near at hand for good measure seems to me a symbol for the small child's environment. Children love to play with other children, with cats and dogs,

but again and again I see that they love most to play with adults.

Any good environment for children has to be stimulating to adults as well, and above all has to allow room for play. I have often heard the argument from friends that they had to move to the suburbs or to the country because of their children. All too fast they conclude that cities in general are not good for children. I would answer that what we have allowed our cities to become—mainly a place for grown-ups to work in (not to mention the absurdity of a great part of this work)—makes them too tough an environment for children. I would even go so far as to say that if cities are too tough for children they are also too tough for adults, with the difference that adults seem able to survive physically under just about any conditions. The harm they suffer shows itself somewhat later on and then mostly in what society becomes as a whole.



Dolf Schnebli

If we try to look at a city as a good place for a child to grow up in, we will start again to build cities for people to *live* in. Under our present system of values the city fit for work and play seems still far away. As long as we approach the problem primarily from a technological viewpoint, it will have no solution.

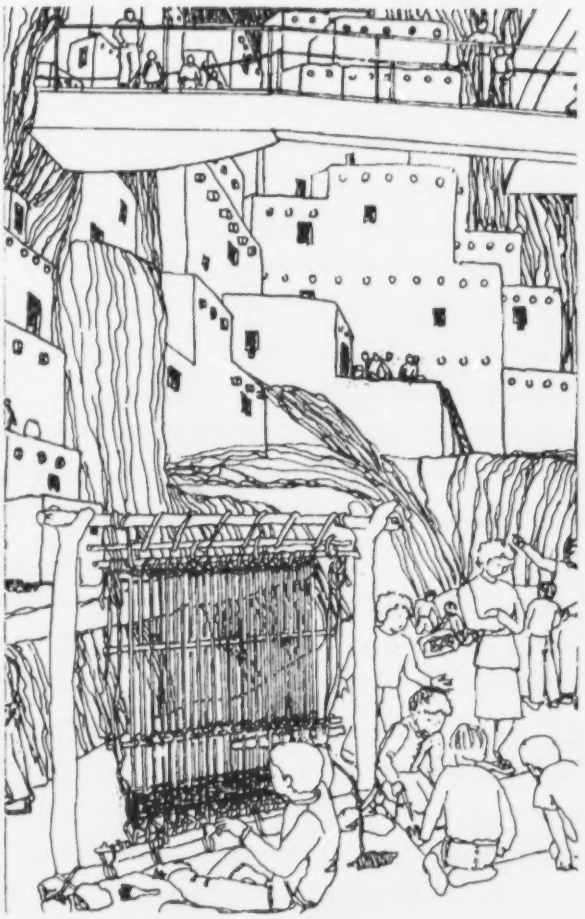
I think school buildings—which should be mainly environments for children—illustrate the dilemma we are in. Schools are being built increasingly bigger because of the efficiency in their use: the busing of children, the economy of a large kitchen, the maximum use of equipment, the application of economical building techniques, and so on, are the criteria for the number of students that have to be herded together. Educational theory has progressed to such an extent that the curriculum and its probable future changes are often the only criteria for school designs, in addition to those of economic efficiency already mentioned.

It is too easily forgotten that a child is not only a student but also has a life to live. I visited a new school highly praised for its educational facilities, which included an elaborate information center, all kinds of electronic gadgetry, spaces for small and large groups as well as for individual tutoring, excellent facilities for gymnastics and manual work—in short, a perfect curriculum translated into a diagram of a building. But the school did not have any windows. When I asked the principal about this, he told me that windows are undesirable because artificial light is more easily controlled and weather conditions which might affect the children can be shut out. He explained at length that before a thunderstorm or snowfall children are much more excitable; with a completely controlled environment (light, temperature, and acoustics), it is easier for the teachers to keep their students under control. It reminded me of the habit of some farmers in one of our backward regions. To calm a crying baby, they give it a little rag soaked in applejack to suckle on. What difference is there when we replace the stick of the authoritarian teacher with more subtle environmental controls—the repression only more sophisticated, probably more effective, and therefore more damaging. No wonder one talks today of a school "plant" or educational center when referring to what used to be called the school-house.

The same has happened in other countries—scuola—palazzo scolastico—centro scolastico—the lesson one could have drawn from the term "schoolhouse" was rarely learned. After Le Corbusier designed a home for the League of Nations in Geneva in 1927, he published a polemical paper entitled, "A House a Palace." He argued that out of

the same elements one builds a house for people to live in, one ought to build a palace or buildings for humans to work and meet in. Le Corbusier's house for the League of Nations was never built and the lesson of "a house a palace" fell by the wayside.

When I first visited the United States I was struck by the strong contrast between the way young middle-class people live with their families and the conditions in which they work. The houses seemed to me more like workshops for family life: uncomplicated, functional, and unpretentious. On the other hand the make-believe work of the offices in pretentious buildings, the desk size that expresses the importance of the executive sitting behind it, were still part of a hierarchically structured society I thought I had escaped from. Down to many a small detail, a building has nothing to do with a house. Even handrails are too big for human hands. To be able to see out of a building becomes unimportant. Nature seems not to be part of human life anymore. The fracturing of our lives into "living' and "working" has found its expression in the way we build; what is valid for the adult world is naturally valid for the world of children. The same grown-ups who do not live where they work, design and build for their children. No wonder there is no space for play in the buildings conceived under such conditions. But even to adults, perhaps when they live and do not work, it is all too obvious that something is not quite right with our environment.



Learning Environment of the Future, Pat Lange

As a corrective measure they build a few playgrounds where only children are allowed to play. Since adults do not want to get involved in the play of children, the design criteria for playgrounds is all too often one of minimum upkeep. A paved surface and a solid fence around it square off the play space. From the adult point of view an area of that kind is perhaps more functional for playing ball than a city street, but not for children. We should not forget that the inevitable argument with an adult who steps into the play occurring in the street is just as important to the environment for children as the necessary space. An argument, even some fighting with a grown-up, means contact with the world for the child.

Dolf Schnebli

To retire to a little island away from it all is the dream of the overactive adult who is exasperated with the inhuman daily life in our absurd society. When we design a kindergarten or school in an urban or suburban area, the buildings

could too easily become islands for children, unless we make a conscious effort to bring the buildings in contact with the life of the surrounding areas. If the island is easily accessible or is used to connect one part of the town with another, it can become a central area. To illustrate this principle, we can use the public school of Wohlen, Switzerland.

Some main pedestrian ways connecting a residential section with the railway station in the other part of town lead right through the center of the school area. This center is designed as an amphitheater-like recreation plaza. Children and grown-ups meet in a natural way. The steps are used for play and reunions by young and old, as well as for staging community festivals and political meetings. In addition, the whole school is designed as what we call an "open house." On evenings and holidays the spaces for assembly, crafts, and sport activities are used by the adult population of the town. The school becomes a meeting place for leisure-time activities. The world of children becomes also the world of adults. As sometimes happens in a family, that after a certain time the parents begin to learn from their children as much as the children learn from the parents, so in a bigger community the grown-up population can learn from the children. If they relearn to play in their leisure-time, work and daily life eventually may become more playful for everyone.

When a school or kindergarten is designed, the client is generally represented by a school building committee; the children themselves are seldom consulted. With luck, at least some of the members of the school building committee are genuinely interested in the children's lives. Such members are generally less influential than the financial, technical, or educational experts, but nevertheless they are there. It is with these people that one can start the discourse about what makes a good environment for children. Because one talks about children, one is still taken seriously when, as an architect or specialist for designing buildings, one talks about the sun, the seasons, the trees and other plants, or even about cats and dogs. Naturally, technical and, above all, the financial aspects of the building have priority, but if it does not look as buildings should by adult standards, it is tolerated because it is for children. A school can become a cluster of huts. A central skylight used also for natural ventilation gives a good diffused light in a whole room, and windows of the size that remind the child of the familiar scale of the house allow visual contact with the outside world. Or the wardrobe in the hall together with the room number make part of a three-dimensional painting.

Children like to understand the environment they are in. If the construction explains itself or suggests answerable questions, it stimulates the sense of inquiry. Stairs and steps are not only to connect one level with another, but also to play on and to experience the spaces from different viewing points. Handrails are to hold on to, but one day they can, in the fantasy of a child, become a friendly beast.

When little children enter a big space like a cathedral, the first thing they do is to step hard on the floor to listen to the reflection of sound. I have noticed again and again that children listen to spaces. Spaces for children should not be acoustically dead. If the sound

Learning Environment of the Future
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reflection is too much for them, they make less noise. Treatment of hard surfaces to diffuse sound reflection creates a much more lively and agreeable acoustical climate than one deadened by excessive absorption of sound by acoustical materials.

Naturally, children love to find some things made especially to their size. A door through which an adult can enter only if he squats, as access to the playhouse, has two advantages: first, adults rarely enter the space, and second, when they do they are cut down to size—they play on the same level with the children. Like grown-ups, children are also individual human beings, and like all human beings they feel different on different days and again different at different times of the day. Sometimes they like privacy, sometimes nothing is better than company. In a good environment there are communal spaces as well as places for the individual to retire to. The more I got involved in designing places for children to work and play, the more I became aware that any good environment for human beings would be a good environment for children. It would be an interesting project to apply disciplined methods of system design to the creation of a square mile of city good for children to live and grow up in. This city would be an environment valid not only for children but also for their parents, grandparents, teachers, pets, and other friends. The sick and the mentally different from the accepted norm would live in that kind of city not only tolerated, but as an integrated part of a community of man.

Beauty, Morality, Sunshine and Freedom

George Anselvicius, FAIA

Professor emeritus, University of New Mexico

When Professor Anne Taylor asked me to contribute an article for an issue of "MASS" on the subject of "Architecture and Children", I remembered Alfred Roth, the Swiss Architect who in 1950 wrote an important book "New Schools". Leafing through the book again, I came across a chapter "The Importance of Physical Environment on the Aesthetic and *Moral* (Italics Mine) Education of Youth."

How deliciously old fashioned this now sounds. The chapter starts with a quotation by Plato:

"The well nurtured youth with a just distaste would hate the ugly even from his earliest years, and would give delighted praise to beauty, receiving into his soul and being nourished by it, so that he becomes a man of gentle heart."

Note the mention of the word "Beauty." It is now hardly used by architects and educators, who instead of calling something "beautiful" would rather substitute such words as: meaningful, interesting, expressive, challenging. Using the "B" word or simply trusting the eye, is not good enough intellectually. Criticism now demands more complex (often pretentious) explanations. Being in the eye of the beholder, beauty is not easily dissected or rationally categorized and with cultural diversity on the front burner, euro-centric, western traditions may now be suspect and their "text" seen as too narrow and imperialist. Still Picasso was able to admire "primitive" African Art despite wide gaps of time and culture.

In an age of relativism and skepticism the word 'truth' (just as the word 'beauty') is somewhat discounted by sophisticates. The movie Rashomon elegantly instructed us that truth is just a personal view influenced by a privately perceived reality and/or by a public cultural context. This naturally leads to fashionable "value free" education, and perhaps even to "value free" architecture. The book continues quoting Plato as to aesthetics and morality:

"The right things are those which irrespective of which branch of art they belong, transmit and direct aesthetic pleasure, for they alone are objectively true" and "All grace and harmony in life, which form the moral basis of the human soul itself are determined by aesthetic feelings."

We have strayed far over the years. Enveloped by a materialism and by demands of making education more "useful," schools abandon the teaching of art, music and architecture at the drop of a cent. (In any case, architecture was seldom on the agenda.) I doubt if one hears such words as honor, beauty, truth, spirit, nobility in the corridors, classrooms or administrative offices of schools. Unfortunately school bureaucracy and teachers must now spend more time in responding to violence, gangs, race, sex, and are concerned with diversity, political correctness, nose rings, backward worn caps, dress codes and busing. All this leaves little time for developing "The Gentle Heart". (The latest school in Dallas has 37 surveillance cameras and metal detectors and 5 full time police officers and a security-conscious configuration.)

- The chapter continues with Alfred Roth stating the following four principles:
- Education and life must be considered as a whole
- The moral man is the main goal of education
- Aesthetic Education is a necessary premise of moral education
- Aesthetic Education means artistic education through the medium of beautiful things

Beyond a call to the spirit, the last two admonitions are surely messages to architects, as buildings, or at least some of them, could be classified a "Beautiful Thing." An old fashioned view again, espousing a belief that there is a necessary connection between the beautiful and the moral.

This was the view of Nicholas Pevsner the 20th Century architectural historian who insisted that the modern design he favored was not merely a style,

but born of necessity true to the spirit of the time (the Zeitgeist). He writes:

> "A metal bedstead masquerading as wood, all that is immoral, so are sham materials and sham techniques, and so is all showy pompous, blatant design."

An added caution for architects was this demand for a somewhat puritan attitude, essentially praising modesty and decrying waste. Surely this is not a bad philosophy for the design of schools as well as the education of children. Proponents of modern architecture insisted that beauty was not superficial (showy) but could be revealed in a truthful, direct and sensitive use of materials and thus not value free. This attitude clearly is in conflict with present forces which sell illusion, entertainment, consumerism, nostalgia and complexity, a different set of values which are now deeply implanted in the consciousness of children and adults by our culture and touted by the media. These values have found their way into the practice of architecture, "Disney Style" architecture is taken seriously rather than as a humorous distraction.

Enough of preaching and back to architecture and design of schools. If we agree with Plato that beauty can make a youth into a person of gentle heart, the design of schools, places a heavy responsibility on the shoulders of architects and educators.

REFORM

Beyond the necessary linkage of aesthetics and morality, imperatives of the modern movement emphasized the design of social, communal buildings such as schools and included a concern with peoples health as affected by city planning and architecture. In the 20's and 30's there was widespread belief that a healthy environment meant the outdoors, fresh air and sunshine. (Most proponents came from European countries, where sunshine was at a premium.) This was a reaction to the teeming, smoke laden slums of the working classes in industrial cities with their narrow alleys where sunshine hardly penetrated and disease, such as tuberculosis, was prevalent. It led to reforms in housing. Tenement laws in New York demanded windows in all rooms, and in Switzerland, to date, habitable rooms must be able to receive sunshine. Well-known diagrams by Walter Gropius fixed distances between buildings for access to the sun, and in Le Corbusier's drawing the sun is always present.

OPEN AIR

Architects, in designing schools responded to such environmental concerns. In the 30's and 40's a number of "OPEN AIR" elementary schools were built, most of them in Europe. These schools open their classrooms to a health-giving sun and a fresh, invigorating outdoors in order to provide an appropriate learning and growing environment for children. New technology permitted large areas of glass in classrooms, connecting them to teaching areas in the outdoors.

Among better known examples is the Four Story Elementary School in Amsterdam by architect J. Duiker (1930) which had open air balconies, the size of classrooms, on each floor, the one story Elementary School in Suresnes, Paris, by architects Beaudoin and Lods (1935) where each freestanding classroom connected to a corridor system had three sides of folding glass walls; and the Crow Island Elementary School in Winnetka outside Chicago by architects Eliel and Eero Saarinen (1940) where each self contained classroom had its own outdoor space. All these schools exhibited a sense of freedom and openness.

This led to the design of "Finger Schools," many of them in California. With fine weather as an ally, covered, open corridors linked rows of south facing classrooms (Fingers) with large windows and outdoor teaching areas. A typical example is the Acalanes School in Lafayette, California by architects Kump and Falk(1940-50).

FREEDOM AND FLEXIBILITY

Western educational philosophers as long ago as Pestalozzi in the 18th century and Frobel, Montessori and Dewey in the 19th and 20th, demanded more freedom, openness and flexibility from the educational system. Lewis Mumford in his "Culture of Cities" (1938) states the case:

"From the drill school to the organic school, from closed issues and mechanical indoctrination to open inquiry and cooperative discipline."

A publication by the Educational Facilities Laboratory (now defunct) entitled "EDUCATIONAL CHANGE AND ARCHITECTURAL CONSEQUENCES" (1968), identified new patterns for the planning of schools. These were to: "give freedom to teachers,

administrators and students". Such views demanded changes in the design of schools and particularly of classrooms. Changes had already taken place. Traditional classrooms, linear and hierarchical, with desks bolted to the floor were replaced by non-hierarchical forms (generally square) equipped with moveable furniture to permit more freedom in educational methods, especially team teaching.

These methods promised better quality teaching and improved results, but were based equally on economic considerations of teacher/student ratios under pressure by the ever increasing growth of student numbers.

Freedom and openness were guiding words. Now the word "openness" did not imply as previously a close relationship to nature, sunshine and the outdoors, but a flexibility of classroom design to satisfy new ways of teaching. Some schools, identified as SCHOOLS WITHOUT WALLS, had open plans and went so far as to have no traditional classrooms at all. Such was the Lewis and Clark Elementary School in Riverview Gardens, St. Louis designed by architects Shaver and Company of Salina, Kansas and built in the 60's. It was touted by the Educational Facilities Laboratory in one of its publications PROFILE OF A SIGNIFICANT SCHOOL (1964) as an expedition into uncharted territory. Unfortunately this "territory" required extensive remodeling since the school was built, in order to achieve a more traditional classroom pattern, as preferred by most teachers. A useful warning to architects not to be overcome by the latest fashions or fads.

TECHNOLOGY

Supporters of Modernism believed that 20th century industriaiization would help produce better, more useful, and possibly less expensive buildings. Encouraged partially by British efforts, which included the design of a building system for the Hertfordshire Schools, a "School Construction System Development Program" (SCSD) was proposed in the United States. Its professional staff which wrote the brief for the system, included architects of high visibility such as Ezra Ehrenkrantz. They, too, talked about flexibility, and freedom for new teaching methods. In the brochure "SCSD, THE PROJECT AND THE SCHOOLS" a report from the Educational Facilities Laboratory (1967) the introduction reads: "The project has made possible the new type of building educators know they need-a changeable building for today's rapidly changing education."

The SCSD system, a short lived experiment in improving school buildings by means of prefabrication, did not fulfill its mission, although it was used in a number of schools and some of its subsystems survived. Local economics and cultural attitudes did not support it's approach, even though a subsystem for the skin was not included for political/ aesthetic reasons. The exterior look of such schools was to be left to the particular visions or prejudices of architects and school boards.

ISOLATION

On-going isolation from nature and the outdoors continued with what became known as LOFT SCHOOLS. These designs, generally of large secondary schools, were now based on the use of artificial light and air-conditioning (certainly useful in a hot, humid climate). The plans minimized building perimeter and disregarded orientation. They were often constructed with long span steel joists, making deep and flexble interior space possible. Inward looking, many did have open courtyards in the center which did bring natural light into the heart of such schools but almost never into the classrooms, a reminder that there was an outer, natural world which now could be fully controlled. The attending reduction or elimination of large exterior glass areas in classrooms was clearly beneficial to the economics of air conditioning. It even alleviated the concern of some teachers that gazing at the outer world diverted students' attention, unfortunately an indictment of the teacher rather than of a humane and friendly architecture. Glass breakage and vandalism also discouraged large windows and developed a bunker mentality among school administrators, who abetted by architects achieved a protective, prison-like appearance of some schools, as may be seen in a number of High Schools in the Albuquerque area. While inward looking schools could possibly be a response to a dense urban environment, many of such schools were built on large, open sites in suburbia.

Seeing nature and the outdoors as symbols and reality of health was reversed. These were now seen as dangerous, filled with air pollution, teen vandalism and even adult terrorism. The romantic notion of a

teacher sitting under a tree surrounded by children was passé, and not a fitting vision for a beleaguered bureaucracy of ever larger school systems.

The statement below identifies the basic values inherent in Loft Schools. In a brochure entitled "ENVIRONMENT FOR LEARNING" by Goleman and Rolfe, Architects and Engineers of Houston, Texas and sponsored by the Carrier Corporation of New York it states:

"Modern technology makes practical a new approach...The architect decides that the School can create and control its own environment, *completely* (Italics mine) independent of all outdoor elements."

A theoretical design entitled the "Environment for Learning Research School, " in the same brochure shows a diagram of a large rectangular one story school—all its classrooms without windows. The only openings to the exterior being entrance doors and lobbies. The architects identified as major design determinants space economy and flexibility as well as lower costs (in comparison with a more traditional campus style school).

BIGNESS

In response to an ever growing student population with the attending loss of a sense of belonging among students and faculty, the concept of SCHOOLS WITHIN A SCHOOL was advanced by educational consultants such as Engelhardt, Engelhardt, Leggett and Cornell. In a brochure specifically for a design studio project at Washington University, St. Louis in the 60's these consultants identify the pattern as "one of the most promising developments in High School Education." It subdivides a large school into several Unit Schools of about 250-300 students each. This inevitably led to CAMPUS type schools, separating a number of basic Unit Schools with their classrooms from communal facility buildings, sports centers, and specialized work area buildings. A number of such schools were designed and built since the 50's. Typical examples are the Lower Mercon Junior High School by architects Haleson, Hough Livingston and Larson; the Riverview Gardens, St. Louis High School by architects Hellmuth, Obata and Kassabum; the Senior High School at Groton Connecticut by architect Ashley. Attempts, such as the design of High Schools for 5000 students each in Pittsburgh (to attain racial integration) were not implemented, but made architects employ sociologists as consultants, to better understand the human and social implication of large numbers.

LOCATION

The Little Red Schoolhouse, part of another age which remains deep in our memories, affirmed the connection and closeness between school and its surrounding community.

In the 20's the planner Clarence Stein proposed neighborhoods of one mile diameter having Elementary Schools in their center. In 1943, N. J. Engelhardt, and educational consultant echoed this policy, suggesting the placement of Elementary Schools in the center of neighborhoods, and limiting the walking distance for children to less than half a mile, resulting in schools of 600-800 pupils.

The meaning of a community as it relates to its Elementary Schools has radically changed since those days. It now does not imply a traditional spatial concept as per Stein, but a social concept, organized to effect racial integration, or "diversity." This inevitably resulted in the busing of children, as neighborhoods were hardly integrated.

Such locational policies may not affect the architecture of Elementary Schools directly, but if architecture is to include a concern with urban patterns and their inevitable social consequences, locational policies will result in different urban or suburban configurations. Lately there have been reactions against the busing of children, a wish by some to return to more traditional spatial neighborhood concepts.

NOW

There does not seem to have been any major developments in the design of schools since the 60's, although there has been some shift in attitude as expressed by the distinguished architect Earl Flansburgh of Cambridge, Massachusetts. In the September 1988 issue of the Architectural Record he states:

> "Exterior educational symbolism has replaced interior educational flexibility as a driving force for academic buildings."

The period of radical innovation and experimentation is over for now, and Flansburgh's statement fits perfectly with the latest concern of some architects, their eyes and minds mainly on aesthetics as expressed Post Modernism with its nostalgia as well as in Deconstructivism with its special interest in fragmented and disjointed forms. These movements, at a time of both hedonism and pessimism, show less interest in functional, social and technological issues of architecture, so essential to modernism at a previous time when optimism and belief in a better future were prevalent.

What then of the future? Generally predictions turn out to be false, but at this moment a more conservative society tired of experimentation looks ever more to the comfort of a remembered or imagined past, to a return of traditional basics in education. This will have its effect on the design of schools. Security will be a major determinant in shaping buildings, as will monetary restrictions with the attendant elimination of frills. There will be more need for multi use of school facilities both in function and time and a concern with the needs of the handicapped. If there is to be experimentation it is more likely to occur in the Schools for the very young which may obtain added resources. The "Information Highway" will demand "smart" buildings with accessible floors and fiber optics in response to the use of new media, computers and television as teaching tools and will result in major opportunities in the recycling and remodeling of existing school facilities.

While "media may be the message" (apologies to McLuhan), computers per se (which will be appropriately on the desks of all students) do not yet deliver their own messages as to morality, truth and beauty, issues that were at the hearts of philosopher Plato and architect Roth with their somewhat old fashioned faith. We will have to wait for broader societal transformations.

From "open air" to "loft" there has been a search for an appropriate shaping of schools. Whether this is progress or simply change can be left to the musing of philosophers or one's own biases.

I have always believed that if flowers could be grown on school playgrounds (now asphalted deserts) and tended by school children with love, we could be called a civilized society in search of beauty, morality, sunshine and freedom.

A Case History of a Community School in Sendai, Japan

Hiroko Hosoda, Architect

The History of the School

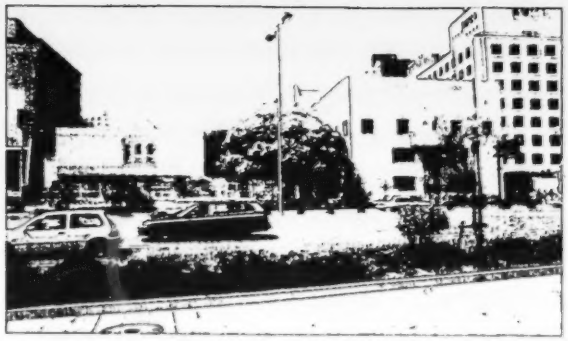
Sendai—located 350km away from Tokyo to the North, with a population of 900,000—is the largest city in Tohoku. This historical development of Sendai started 400 years ago when the ruler of the Date clan, Date Masamune, built the castle, and the scenery of Sendai 270 year of the Date government.

Placed in the central part of Sendai, on a main street, there is a big camphor tree. Around the tree there is a four-storied building; Higashi-Nibancho Elementary School. The school, built in 1883, has had several historical turning points.

First, as an annex to the elementary school, six years after its establishment, the second oldest kindergarten in Japan was built; but unfortunately, both the kindergarten and the elementary school were burned down in 1945, during World War II. Then, the camphor tree loved by children was also burned to ashes.

Three years later, the school was rebuilt. The strange thing is that, when the lively children came back, from the barely remaining stump, buds started to shoot. The camphor grew, and again it became a big tree watching over the children and charming the inhabitants.

In 1964, a center for Sendai citizens and working youths was built as an annex to the schools. It was a revolutionary idea at the time. But in 1978, because of the great earthquake, the complex was badly damaged, the complex was reinforced since then, but soon, as the damage could no longer be strengthened, in 1985 the government finally decided to pull down the buildings to build a new complex.



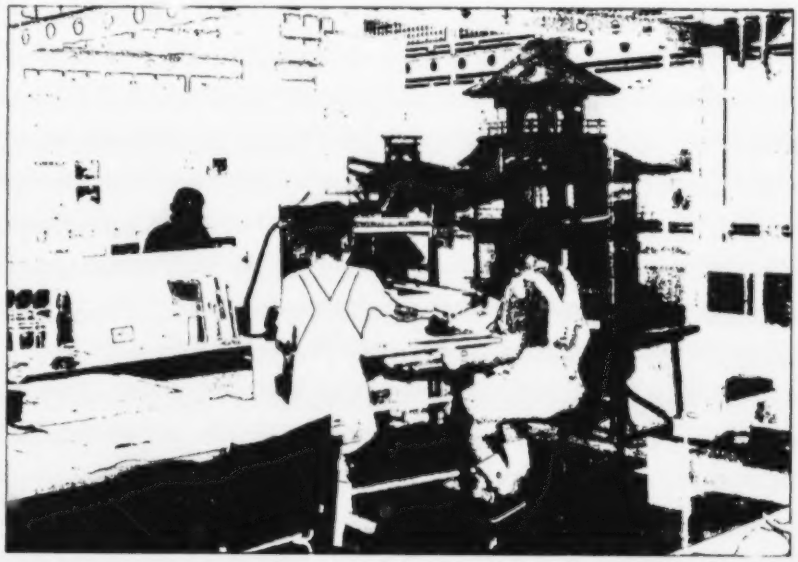
Sendai, Japan Hosada

Reopening the Community School

There were two goals in designing the new complex. First, considering the 20 year old history, the government planned to actively promote joint use of the complex. Second, was planning the new school space.

The first plan couldn't be fully realized because of several legal regulations, but it was possible for a gym, swimming pool and the playground to be used jointly by the members of the youth center, the elementary school and the kindergarten.

Also, the Youth Center and the Citizens' center were built close together, allowing them to share facilities and equipment by each using them at different times.



Hosada

Now, the educational coorganization of the elementary school and the kindergarten has developed. The lower-level elementary school children and the kindergarten kids take part in common programs. The relationship between the

Sendai, Japan

Citizens' Center and the elementary school is not as strong as the one between the school and the kindergarten, but they have a good relationship through joint participation in events.

The First Open School in Sendai

Another factor in the rebuilding of the school was the background of the Japanese school system. Since the 1980s, people began to think about improving the curriculum made by the Ministry of Education of Japan which made schools all over Japan follow fixed programs. People questioned the system of giving the same program to every child. Then, the Ministry of Education started to give orders to schools to consider children's individuality, ability, and improve their creativity. As a result of the changes, the educational legislation of the Ministry has been examined, and changes have been made to the traditional Japanese school style - square classrooms along long corridors - which lasted for 120 years. Besides the move away from the uniform education, newly developed schools with individual educational programs, small-group programs, and more relaxing space fit for studying are increasing. Higashi-Nibancho Elementary School, in this changing age, introduced the first open school system in Sendai. The school has the following characteristics:

1. Each classroom has a working space which is sectioned off by things as bookshelves. In this working space, there is a sink, enabling many types of study and school activities.
2. The home economics room and the art workshop are designed like lounges and can be used for many purposes as well as classrooms.
3. The hall with a tall ceiling on the second floor is a space used by anybody in any class or grade; each class or grade can use it by themselves or with others for many purposes such as conferences, dining, exhibitions, musical events, calligraphy or play.
4. At the top of the school, there is a 25m swimming pool and a smaller pool. Also, to make it more convenient, there is a gym on the fourth floor connected to the pools and classrooms. As well as these things, the water in the pools can be used for fire emergencies.
5. Most of the furniture is movable so it can be used for many purposes.

In these ways, the school building as a whole is made open and flexible to be suitable for studying and other activities. Also, since the school's main gate is located on Higashi-Nibancho-dori where many children pass by, the first floor is used as an arcade to create an open space; also, it surrounds the camphor tree with a semicircular space from the southern part of the second floor. This space is used as a lobby leading to the library where you can look at the camphor as you go by. From this space, as the glass in the semicircular part reflects light from outside, you can see the camphor, which is the symbol of the school, more clearly.

JAPAN - USA CULTURAL AND EDUCATIONAL EXCHANGE THROUGH ARCHITECTURE AND CHILDREN

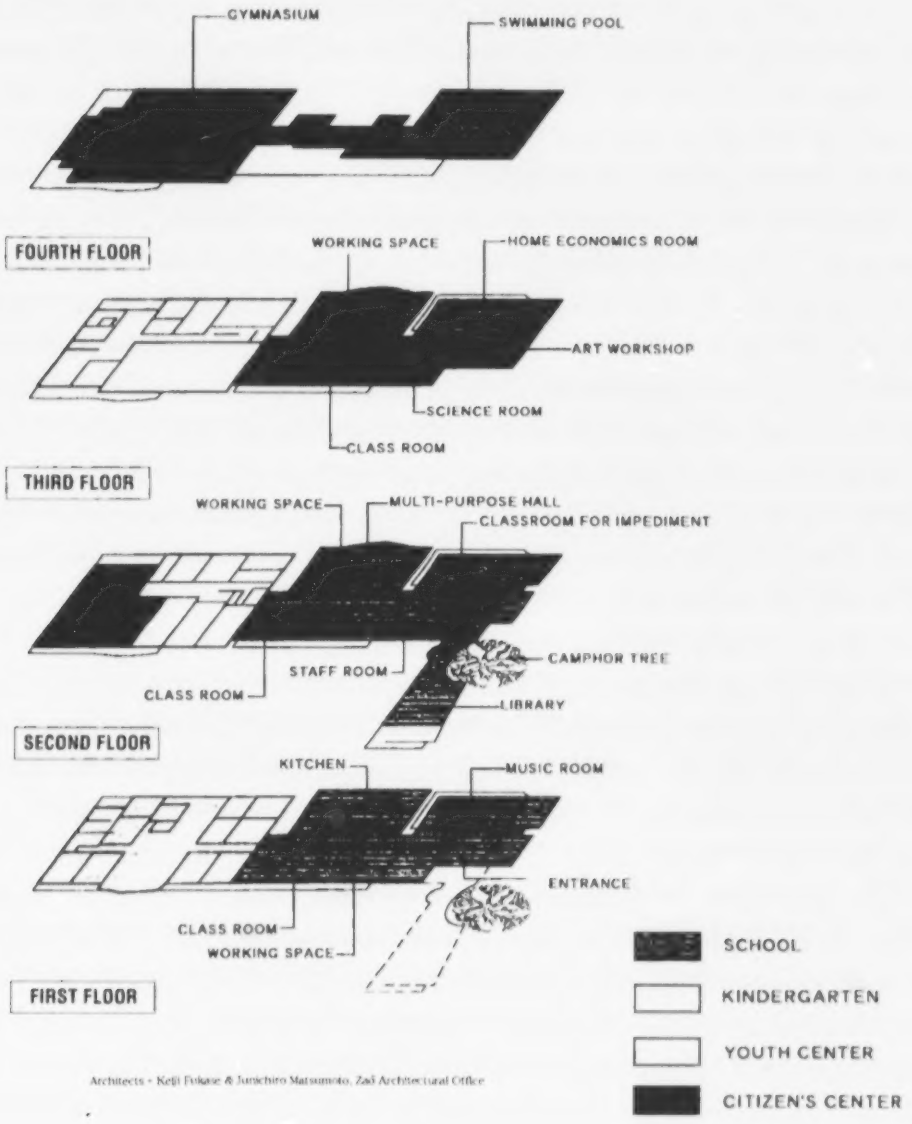
In 1992, using this open space, there was a workshop of Architecture and Children with the second grade and fourth grade pupils. Architecture and Children was founded and has been developed since 1978 by Dr. Anne Taylor of the University of New Mexico and she introduced it into Sendai in 1991. The purpose of Architecture and Children Program is to develop children's problem-solving ability and creativity through architectural designing. Many teachers and architects from other schools came to see the workshop and they all seemed to

be inspired by the idea of a study program using the theme of architectural designs, which does not yet exist in Japan.

At present, we 32 members, architects, teachers and students, have formed a group "Architecture and Children Network Sendai" in order to study and promote the curriculums. We have developed many workshops and seminars since 1992. In 1995, our network sponsored "1995 Architecture and Children Exchange Program in U.S.A." 17 people participated in this program and studied in New Mexico. From April 2nd to June 30th 1996, we held the exhibition about Architecture and Children at the Sendai Science Museum. During the exhibition, 11 workshops and a seminar were also held. At the seminar in June, Dr. Taylor gave a lecture and many people were strongly impressed with the philosophy.

Network Sendai will maintain an intimate relationship with New Mexico and we are planning to introduce and develop the "Architecture and Children" curriculum in this area. I hope that some day the program will be practiced through the Ministry of Education curriculum.

The Architecture and Children Network was founded in 1995 by Prof. Takeshi Inaba of Kyoritsu Women's University in Tokyo. Architecture and Children Network has branches in Sendai, Niigat and Joetsu.



Architects : Keiji Fukase & Junichiro Matsumoto, Zaa Architectural Office

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Lessons in High School Planning and Design

C. William Brubaker F.A.I.A.

Why are we planning and building new high schools? Construction of educational facilities reached an all-time high in 1989-$14.1 billion-much of which was for new buildings. The demand for new schools has been fueled by demographic changes and the obsolescence of many existing buildings.

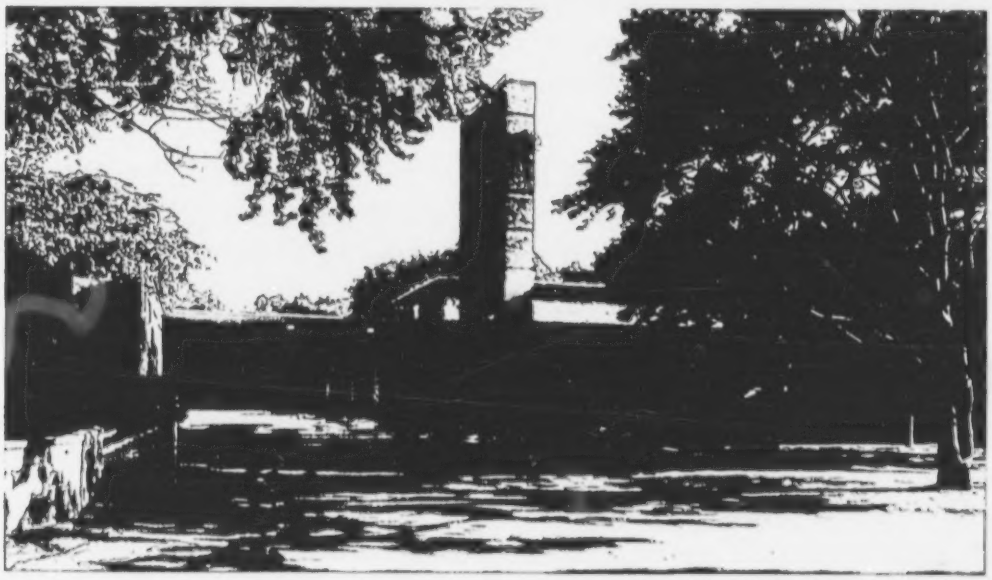
Communities are experiencing increases in enrollment or shifts in enrollment to new areas, creating overcrowded conditions in existing facilities. This trend is more apparent at the K-8 level, but will have more impact at the secondary level in coming years as the "baby boomlet" matures.

More than 50 percent of existing schools were built during the 1950s and '60s. When student enrollment declined in the 1970s and '80s, citizens were not interested in spending more than minimal amounts for maintaining school buildings. During this time, however, existing, high school buildings aged 20 years.

"Wolves at the Schoolhouse Door," a report by the Educational Writers Association, found that 25 percent of the nation's school buildings are in poor physical condition and not suitable for safe occupancy. The buildings often have obsolete mechanical and electrical systems, which consume large amounts of energy, while others have problems with roofing, asbestos, handicapped accessibility, fire codes, or high maintenance and operational costs.

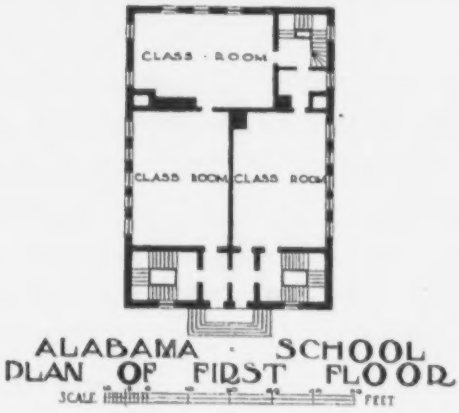
Whether due to the inadequacy of a school or its unsuitability to a community's needs, the result is a pent-up demand for improved facilities. While school boards attempt to resolve these deficiencies through commissioning studies and subsequent renovation programs, often the most rational- and economical-solution is to replace the old facility with a new building.

In undertaking, a new building program, school boards are charged with creating a quality facility for their students.



Crow Island School Perkins and Will

This mission, however, assumes both problems and opportunities unique to each community. The following case studies discuss the different needs and design solutions for four communities.



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Brubaker

Replacing an Old School with a New School

Troy, MI, is a classic example of a thriving suburb, adjacent to a metropolitan area (in this case, Detroit), that has undergone economic growth and development. Many upscale homes have been built in the community in recent decades, and many new office buildings and hotels have been constructed, significantly expanding the tax base.

The Troy Board of Education asked Perkins & Will to evaluate one of its existing high schools to determine the feasibility of renovating and expanding the building, athletic facilities, and parking to meet its current program. The renovation program would also improve the inefficient functional relationships that had developed as the school expanded over the years.

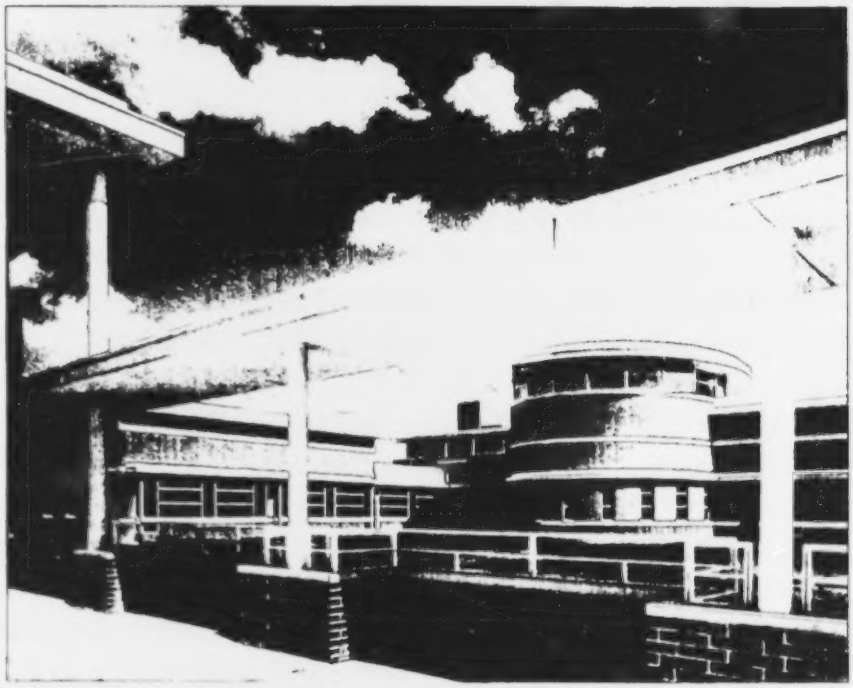
The survey concluded that any building additions or renovations would be costly and still deemed inadequate. Located on a busy corner in the commercial center of town, Troy High School was trapped on its site, which was too small to satisfy the school's needs for play fields, parking and landscaped areas of the quality that citizens have come to expect for their children.

The survey also revealed serious physical deficiencies. In spite of some community sentiment which favored keeping the facility, the cost of removing asbestos, retrofitting mechanical/electrical systems, and installing, new roofing and insulation, rendered saving the school as impractical. Renovation and preservation of existing buildings sometimes makes good sense, but each situation must be carefully studied, and evaluated. In this case, the high cost of renovation argued against re-use of the existing building.

Concurrently, the board was holding a vacant property for a future unidentified use. This site offered a bonus of a superb location and adequate size (almost 70 acres). Served by major access roads. the site is in close proximity to residential areas and away from the commercial center of town.

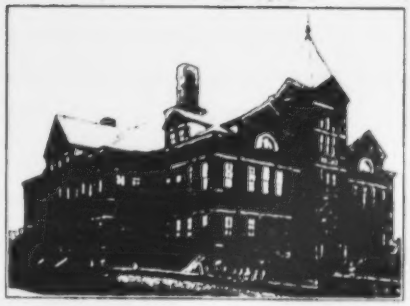
25 percent of the nation's school buildings are... not suitable for safe occupancy. Often the most rational and economical solution is to replace the old facility with a new building.

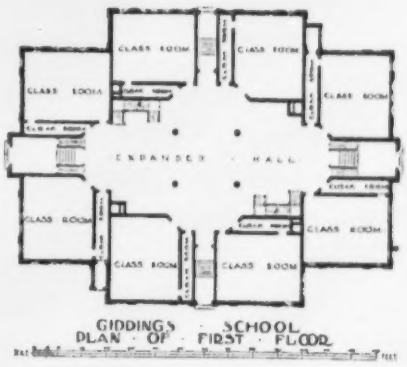
The new 284,000-square-foot building, designed for 1,750 students, evolved from numerous planning sessions with teachers, administrators, board members, students and citizens.



Perkins and Will Architects

Dr. Barbara Fowler. Assistant Superintendent of Troy Schools, developed the educational program in conjunction with the Troy High School faculty, administration and board of education. The program was given to Perkins & Will for preparation of a 20-page graphic program summary which showed to scale all required spaces and their relationships, as well as preliminary layouts of laboratories and studios. The book was distributed for review to those who participated in the initial stages of developing the program. Over a three month period the architects conducted meetings with department heads and faculty to elicit their comments. While minimal fine-tuning was required, the faculty's special requests were abundant natural light in the classrooms and adequate provisions for developing technology.





At the same time, public board meetings were held and citizens' concerns were identified; namely traffic circulation and preservation of the natural environment. A priority registered by the board and the school administration was ease of future expansion.

The meetings and final program document served as the architect's guide for the design of Troy High School. The library and dining room form the center of the plan, with two- and three-story academic wings facing the

community's main drive. Physical education and athletic facilities, including a swimming pool, are oriented to the playfields. The wings provide a logical means of independently expanding the school's facilities, especially classrooms. The wings also allow for the extensive use of windows-meeting the teachers' request for natural light throughout the school. A tower symbolically marks the main entrance to the complex, but it is also functional, housing a stairwell and mechanical equipment.

The facility provides for a large-scale integrated telecommunications system within the building, which will accommodate real-time data networking, comprehensive voice/audio communications, and multi-channel two-way video distribution. While the majority of the telecommunications equipment is housed near the library, cable trays incorporated into the corridor ceilings will carry conduit for hook-up into other spaces.

Access throughout the grounds is well controlled. Cars and buses share the same roadway, but for safety and efficiency reasons, they are routed to different locations. The bus drop-off is adjacent to the main entrance, where there is also parking for 12 cars. Faculty and students have separate parking lots, which accommodate 185 and 515 spaces respectively. Not only do the different terminuses help in managing traffic, but the arrival sequence (faculty, buses, students with cars) also mitigates any vehicular congestion.

The gymnasium and theater each have their own entrances. Primary access is provided from the faculty/student parking lot, which is used for general parking during athletic and community events. Additional parking/ practice fields encircle the stadium and are surrounded by a wooded preserve, providing privacy and protection for the students and serving as a buffer between the surrounding homes and the school.

Perkins and Will Architects

Troy High School will use brick on its interior and exterior. The construction for the academic unit is load-bearing masonry walls with precast concrete floors. While the initial costs for this type of construction may be higher than other materials, masonry's life cycle costs are lower. In addition to its durability and low-maintenance properties, masonry also aids in heat absorption and retention- a critical consideration for a facility in the Great Lakes region. An additional benefit of this construction type is energy efficiency.

Structural steel framing proved to be more economical for the special facilities such as the gymnasium, dining hall, and theater, which require construction of long, clear spans or high ceilings.

In a bond referendum, voters approved the plan to create a new campus, and the new Troy High School is currently under construction. When completed the community will benefit from a state-of-the art high school

on an ample site that will not only solve current educational and community needs, but also will allow for future expansion in the school program.

Major Expansion at an Existing Site

As one of the fastest growing areas in Indiana, as well as the Midwest, the community of Warsaw required additional school facilities to house the steadily increasing number of students entering its school system each year. The community, however, wished to address more than the need for physical expansion in constructing a new high school. Changes in curriculum and teaching style required a facility that would decentralize the administration and have the technological capability to disseminate the expansive, varied resources to be housed in the new school. Warsaw required a high school facility that would respond to the immediate problems of size while preparing for the needs of the 21st century student.

The Odle, McGuire & Shook Corporation and Perkins & Will were commissioned to plan and design the comprehensive 2,000 student, 4-year high school adjacent to the site of the existing freshman high school. Working closely with the school administration and faculty, and KBD Associates, the educational consultant, we found that the existing freshman high school could best accommodate the new vocational/ technical program; the new 256,000-square-foot facility houses classrooms, laboratories, library, dining room, gymnasium and administrative offices.

Warsaw Community High School is designed as a quadrangle (a form usually associated with universities) adjacent to the newly-renovated existing building. A number of the owners special requirements give the 2,000-pupil school a special character. Teachers unanimously requested classrooms with windows, which was met by incorporating a few small courtyards in addition to the larger central quadrangle space. The quadrangle is easily secured at night by closing gates at the

Pat Lange

bus-loading area. The board of education requested pitched roofs; efficient light steel trusses are used to form the visible roofs over the two-story building units. Upper floor corridors benefit from natural daylight admitted through bands of small windows.

Another requirement of the program was a gymnasium with a seating capacity of 5,000 people. By flanking the main gym with two balcony gyms, and using electrically-operated folding bleachers, both the physical education curriculum and the athletic programs are accomodated within the budget.

Warsaw High School was built for approximately $80 per square foot. Contributing to its cost-effectiveness are the selected materials. The exterior materials consist of masonry and metal siding and roofing. Not only do the materials evoke images indigenous to the surrounding environment, but they are long-lasting and easy to maintain. The interior, with its terrazzo flooring, vinyl wall covering and painted block, was designed to be durable as well.

Expressing a vision toward the future, Warsaw High School features voice, video, and computer capabilities throughout the school. The image of the school with its pitched roof and materials is a response to the surrounding agricultural community.

Finally, the new high school provides some well-landscaped open space for the community, while allowing room for future expansion.

The School as a Community Center

Perry, OH, is a rural community located on Lake Erie, 30 miles east of Cleveland. The educational consultant, Dr. Dwayne Gardner, worked with the administration in determining the education program. A decision was made to replace the school district's aging facilities and consolidate them to a single location, a 160-acre site near the center of the town. Envisioning a campus for the entire community, a decision was made to also build a fitness center on the site.

Perry Community Education Village includes Grades K-4 elementary school, Grades 5-8 middle school, and Grades 9-12 high school. In addition to the fitness center, which provides a swimming pool, field house, racquet ball courts, etc., for both students and other Perry residents. Each school is designed to accomodate 1,500 students and functions independently with its own classrooms, laboratories, gymnasium and library/dining facilities.

It is not unusual for rural communities to consolidate their educational facilities. There are cost savings in reducing the number of additional schools built and not duplicating special functions such as athletic and dining facilities. Savings in the cost and time of transporting goods between schools are additional benefits. One of the largest savings to the school district, however, is operating costs. At Perry, the schools and fitness center share a common mechanical plant, kitchen and maintenance facility, as well as an 850-seat auditorium (fulfilling the broader cultural and assembly needs of the Perry community).

The central plant not only reduces the operating costs, but also proves to be highly energy efficient.

The elementary and middle schools are located east of a wooded ravine that bisects the site, while the high school and fitness center are located west of the ravine. Each of the schools has its own playfields, vehicular access, bus loading, and main entrance. Towers mark the entrances on each side of the ravine. Pedestrian bridges link the two campus areas as well as connect the schools and fitness center with one another.

The complex (designed by Burgess & Niple, Ltd. and Perkins & Will) is developed as an idealized organization of a village on each side of the ravine and is broken down into a limited number of discrete and repetitive parts. These parts are defined by different scaled versions of extruded shapes with curved roofs. They include lofts (for classrooms and office sections), columnar halls (for dining rooms and lobbies), clear span halls with repeating small curved roofs (for the pool, fieldhouse, and the multipurpose and activity rooms), and large singular forms (for the auditoriums and competition gymnasiums).

Perry Community Education Village is designed to be audiovisual interactive and will offer television broadcasting and receiving capabilities and communications hook-ups in all classrooms. A structural steel framing system and the modularization of building systems (walls, ceilings, etc.) provide the flexibility required to incorporate Perry's sophisticated technological system. A tunnel under the complex and a perimeter trench, house the mechanical, electrical, and technological utilities, providing ease of access for the maintenance staff and maximum adaptability to future needs. Perry Community Education Village's innovative campus reinvigorates the "education park" concept. Currently, the high school is under construction. When completed, the integrated,self-contained educational complex will benefit the students, their families, and all Perry residents.

A High School with Regional Character

Santa Fe, NM, is known for its rich Hispanic and Indian culture and its unique architecture. Santa Fe's existing high school was crowded and had been built as a campus composed of more than a dozen buildings, including portable classrooms. The board of education desired a single building, or a limited number of buildings which would be closely related as a compound. The board of education in this community commissioned Mimbres, Inc., and Perkins & Will to plan and design an additional school for Santa Fe. The 160,000-square-foot school is located at the city's southern edge, where much residential growth is planned.

The new Capital High School is relatively small, with an enrollment of 800 pupils, but is planned to accommodate 1,300 pupils. The gymnasium, theater, arts area, dining facility, administration space and library are sized for the anticipated larger student body. When required, additional classrooms will be built, following the master plan for campus development. The school design, which was conceived as a series of five connected pavilions, allows for the flexibility to respond incrementally to projected enrollment growth and to be modified as program priorities change.

Towers, found in many local public buildings, not only symbolize but define three significant ports of entry to the classrooms, the gymnasium and the theater. Primary vehicular access leads to these functions. School buses arrive at a circular drive at the 2-story academic wing, while visitor parking is located in a separate area adjacent to the gymnasium and theater.

The heart of the school is a square courtyard around which are located the library, cafeteria, laboratories, studios, and the theater. Portales (sheltered walkways), as experienced in old Santa Fe, are a part of the design.

Second floor classrooms and the library have ceilings supported by heavy wooden beams-another distinguishing characteristic of Santa Fe architecture. Finally, desert colors are used, helping to create a school which is attuned to the New Mexico culture.

By incorporating local building traditions such as concrete frame, concrete block, stuccoed walls, and wood ceilings, a school was created that was economical (built for $83 per square

foot) as well as appropriate to the unique culture and environment of Santa Fe.

The school was recognized with a Certificate of Excellence from ASBO International's 1989 Architectural Exhibition. Upon completion, Capital High School received a national Honor Award from the American Institute of Architects as well as an Honor Award from the Chicago Chapter of the American Institute of Architects.

Conclusion

Each of these high schools is different, reflecting the community's vision for its educational program and specific enrollment. What is common to them all, however, is the pride the community takes in the traditions, climate, and culture of its city. Local building materials and methods are used, generating a unique architectural design for each individual high school building.

A school building program is an opportunity for the community to express its commitment to education. It is also an opportunity to maximize the value of the institution for all citizens.

Ecology and Community

By: Fritjof Capra

Fritjof Capra, Ph.D., physicist and systems theorist, chairs the Board of Directors of the Center for Ecoliteracy. This seminar was first given at a retreat for the faculty and administrators of the Mill Valley School District in August, 1994.

Capra

The understanding of community is extremely important today, not only for our emotional and spiritual well-being, but for the future of our children and, in fact, for the survival of humanity.

As you well know, we are faced with a whole series of global environmental problems which are harming the biosphere and human life in alarming ways that may soon become irreversible. The great challenge of our time is to create sustainable communities; that is, social and cultural environments in which we can satisfy our needs without diminishing the chances of future generations.

Capra

In our attempts to build and nurture sustainable communities we can learn valuable lessons from ecosystems, which *are* sustainable communities of plants, animals, and micro-organisms. In over four billion years of evolution, ecosystems have developed the most intricate and subtle ways of organizing themselves so as to maximize sustainability.

There are laws of sustainability which are natural laws, just as the law of gravity is a natural law. In our science in past centuries, we have learned a lot about the law of gravity and similar laws of sustainability. If you go up to a high cliff and step off it, disregarding the law of gravity, you will surely die. If we live in a community, disregarding the laws of sustainability, as a community we will just as surely die in the long run. These laws are just as stringent as the laws of physics, but until recently they have not been studied.

The law of gravity, as you know, was formalized by Galileo and Newton, but people knew about not stepping off a cliff long before Galileo and Newton. Similarly, people knew about the laws of

sustainability long before ecologists in the twentieth century began to discover them. In fact, what I'm going to talk about today is nothing that a ten-year-old Navajo boy or Hopi girl who grew up in a traditional Native American community would not understand and know. In preparing this presentation, I discovered that if you really try to distill the essence of the laws of sustainability, it's very simple. The more you go to the essence, the simpler it is.

What I want you to understand is the essence of how ecosystems organize themselves. You can abstract certain principles of organization and call them the principles of ecology; but it is not a list of principles that I want you to learn. It's a pattern of organization I want you to understand. You will see that whenever you formalize it and say, "This is a key principle, and this is a key principle," you don't really know where to start, because they all hang together. You have to understand all of them at the same time. So, when you teach the principles of ecology in school, you can't say, "In third grade we do interdependence and then in fourth grade we do diversity." One cannot be taught or practiced without the others.

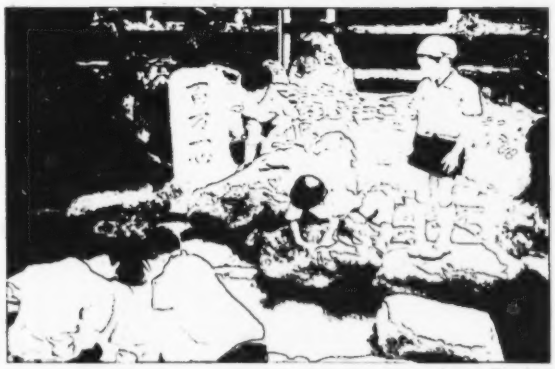
What I'm going to do, then, is describe how ecosystems organize themselves. I'll present to you the very essence of their principles of organization.

Relationships

When you look at an ecosystem—say, at a meadow or a forest—and you try to understand what it is, the first thing you recognize is that there are many species there. There are many plants, many animals, many microorganisms. And they're not just an assemblage or collection of species. They are a community, which means that they are interdependent; they depend on one another. They depend on one another in many ways, but the most important way in which they depend on one another is a very existential way—they eat one another. That's the most existential interdependence you can imagine.

Indeed, when ecology was developed in the 1920s, one of the first things people studied were feeding relationships. At first, ecologists formulated the concept of food chains. They studied big fish eating smaller fish, which eat still smaller fish, and so on. Soon these scientists discovered that these are not linear chains but cycles, because when the big animals die, they in turn are eaten by insects and bacteria. The concept shifted from food chains to food cycles. And then they found out that various food cycles are actually interlinked, so the focus again shifted, from food cycles to food webs or networks. In ecology, this is what people are now talking about. They're talking about food webs, networks of feeding relationships.

Capra



Anne Taylor

These are not the only examples of interdependence. The members of an ecological community, for example, also give shelter to one another. Birds nest in trees and fleas nest in dogs and bacteria attach themselves to the roots of plants. Shelter is another important kind of interdependent relationship.

To understand ecosystems, then, we need to understand relationships. That's a key aspect of the new thinking. Also, always keep in the back of your minds that when I talk about ecosystems I'm talking about communities. The reason we're studying ecosystems here is so that we can learn about building sustainable human communities.

So we need to understand relationships, and this is something that runs counter to the traditional scientific enterprise in Western culture. Traditionally in science, we have tried to measure and weigh things, but relationships cannot be measured and weighed. Relationships need to be mapped. You can draw a map of relationships that shows the connections between different elements or different members of the community. When you do that, you discover that certain configurations of relationships appear again and again. These are what we call patterns. The study of relationships leads us to the study of patterns. A pattern is a configuration of relationships appearing repeatedly.

The Study of Form and Pattern

So the study of ecosystems leads us to the study of relationships, which leads us to the notion of pattern. And here we discover a tension that has been characteristic in Western science and philosophy throughout the ages. It is a tension between the study of substance and the study of form. The study of substance starts with the question, What is its pattern? Those are two very different approaches. Both of them have existed throughout our scientific and philosophical tradition. The study of pattern began with the Pythagoreans in Greek antiquity, and the study of substance began at the same time with Parmenides, Democritus, and with various philosophers who asked: What is matter made of? What is reality made of? What are its ultimate constituents? What is its essence?

In asking this question, the Greeks came up with the idea of four fundamental elements: earth, fire, air, and water. In modern times, these were recast into the chemical elements; many more than four, but still the basic elements of which all matter consists. In the nineteenth century, Dalton identified the chemical elements with atoms, and with the rise of atomic physics in our century the atoms were reduced to nuclei and electrons, and the nuclei to other subatomic particles.

Similarly, in biology the basic elements first were organisms, or species. In the eighteenth and nineteenth centuries there were very complex classification schemes of species. Then, with the

American Institute of Architects

discovery of cells as the common elements in all organisms, the focus shifted from organisms to cells. Cellular biology was at the forefront of biology. Then the cell was broken down into its macromolecules, into the enzymes and proteins and amino acids and so on, and molecular biology was the new frontier. In all of this endeavor, the question always was: What is it made of; What is its ultimate substance?

At the same time, throughout the same history of science, the study of pattern was always there, and at various times it came to be forefront, but most times it was neglected, suppressed, or sidelined by the study of substance. As I said, when you study pattern, you need to map the pattern, whereas the study of substance is the study of quantities that can be measured. The study of pattern, or of form, is the study of quality, which requires visualizing and mapping. Form and pattern must be visualized.

This is a very important aspect of studying patterns, and it is the reason why, every time the study of pattern was in the forefront, artists contributed significantly to the advancement of science. Perhaps the two most famous examples are Leonardo da Vinci, whose whole scientific life was a study of pattern, and the German poet Goethe in the eighteenth century, who made significant contributions to biology through his study of pattern.

This is very important to us as parents and educators, because the study of pattern comes naturally to children; to visualize pattern, to draw pattern, is natural. In traditional schooling this has not been encouraged. Art has been sort of on the side. We can make this a central feature of ecoliteracy: the visualization and study of pattern through the arts.

Now, recognizing that the study of pattern is central to ecology, we can then ask the crucial question: What is the pattern of life? At all levels of life—organisms, parts of organisms, and communities of organisms—we have patterns, and we can ask: What is the characteristic pattern of life? I'm actually working on a book now to answer this question, so I could give you a fairly technical description of the characteristics of the pattern of life; but here I want to concentrate on its very essence.

Networks

The first step in answering this question, and perhaps the most important step, is a very easy and obvious one: the pattern of life is a network pattern. Wherever you see the phenomenon of life, you observe networks. Again, this was brought into science with ecology in the 1920s when people studied food webs—networks of feeding relationships. They began to concentrate

Pat Lange

on the network pattern. Later on, in mathematics, a whole set of tools was developed to study networks. Then scientists realized that the network was made up of smaller components. So what you have is networks within networks. Whenever you look at life you look at networks.

Then you can ask: What is a network and what can we say about networks? The first thing you see when you draw a network is that it is nonlinear; it goes in all directions. So the relationships in a network pattern are nonlinear relationships. Because of this nonlinearity, an influence or message may travel around a cyclical path and come back to its origin.

In a network, you have cycles and you have closed loops; these loops are feedback loops. The important concept of feedback, which was discovered in the 1940s, in cybernetics, is intimately connected with the network pattern. Because you have feedback in networks, because an influence travels around a loop and comes back, you can have self-regulation; and not only self-regulation, but self-organization. When you have a network—for instance, a community—it can regulate itself. The community can learn from its mistakes, because the mistakes travel and come back along these feedback loops. Then you can learn, and next time around you can do it differently. Then the effect will come back again and you can learn again, in steps.

So the community can organize itself and can learn. It does not need an outside authority to tell it, "You guys did something wrong." A community has its own intelligence, its own learning capability. In fact, every living community is always a learning community. Development and learning are always part of the very essence of life because of this network pattern.

Self-Organization

As soon as you understand that life is networks, you understand that the key characteristic of life is self-organization. So if somebody asks you, "What is the essence of life?: What is a living organism all about?," you could say, "It is a network and because it is a network it can organize itself." This answer is simple, but it's at the very forefront of science today. And it is not generally known.

Furasawa

When you go around in academic departments, this is not the answer you will hear. What you will hear is "Amino acids," "Enzymes," and things like that; very complex information, because that is the inquiry into substance: What is it made of?

It is important to understand that, in spite of the great triumphs of molecular biology, biologists still know very little about how we breathe or how a wound heals or how an embryo develops into an organism. All of the coordinating activities of life can only be grasped when life is understood as a self-organizing network. So self-organization is the very essence of life, and it's connected with the network pattern.

When you look at the network of an ecosystem, at all these feedback loops, another way of seeing it, of course, is as recycling. Energy and matter are passed along in cyclical flows. The cyclical flows of energy and matter—that's another principle of ecology. In fact, you can define an ecosystem as a community where there is no waste.

Of course, this is an extremely important lesson we must learn from nature. This is what I focus on when I talk to business people about introducing ecoliteracy into business. Our businesses are now designed in a linear way—to consume resources, produce goods, and throw them away. We need to redesign our businesses to imitate the cyclical processes of nature rather than to create waste. Paul Hawken has recently written about this very eloquently in his book *The Ecology of Commerce.*

So we have interdependence, network relationships, feedback loops; we have cyclical

flows; and we have many species in a community. All of this together implies cooperation and partnership. As various nutrients are passed along through the ecosystem, the relationships we observe are many forms of partnership, of cooperation. In the nineteenth century, the Darwinists and Social Darwinists talked about the competition in nature, the fight—"Nature red in tooth and claw." In the twentieth century, ecologists have discovered that in the self-organization of ecosystems cooperation is actually much more important than competition.

We constantly observe partnerships, linkages, associations; species living inside one another, depending on one another for survival. Partnership is a key characteristic of life. Self-organization is a collective enterprise. We see that these principles—interdependence, network patterns, feedback loops, the cyclical flows of energy and matter, recycling, cooperation, partnership—are all different aspects, different perspectives one and the same phenomenon. This is how ecosystems organize themselves in a sustainable way.

Flexibility and Diversity

Once you have established that, then you can ask more detailed questions, such as: What is the resilience of such an organization? How does it react to outside disturbances? In this way, you will discover two further principles that enable ecological communities to survive disturbances and to adapt to changing conditions. One is flexibility. Flexibility manifests itself in the network structure, because networks in ecosystems are not rigid; they fluctuate. Whenever you have feedback loops, if there is a deviation, the system brings itself back into balance. And since these disturbances happen all the time, because things in the environment change all the time, the net effect is a continual fluctuation.

Everything in an ecosystem fluctuates: population densities, supplies of nutrients, quantities of rainfall, and so on. And that is also true for an individual organism. Whatever we observe in our body—our temperature, our hormonal balance our skin humidity, our brain waves, our breathing patterns—all fluctuate. This is how we can be flexible and adapt, because these fluctuations can be disturbed and then will come back again to a healthy fluctuating state. So flexibility through fluctuations is the way ecosystems remain resilient.

Of course, this does not always work, because there can be very severe disturbances that will actually kill a particular species, just wipe it out. What you have then is that one of the links in a network is destroyed. An ecosystem, or any kind of community, will be resilient when this destroyed link is not the only one of its kind; when there are other links, other connections. So when one link is wiped out, the other ones can at least partially fulfill its function. In other words, the more complex the network is and the more complex all these connecting links are, the more resilient it will be, because it can afford to lose some of its links. There will still be plenty there, fulfilling the same function.

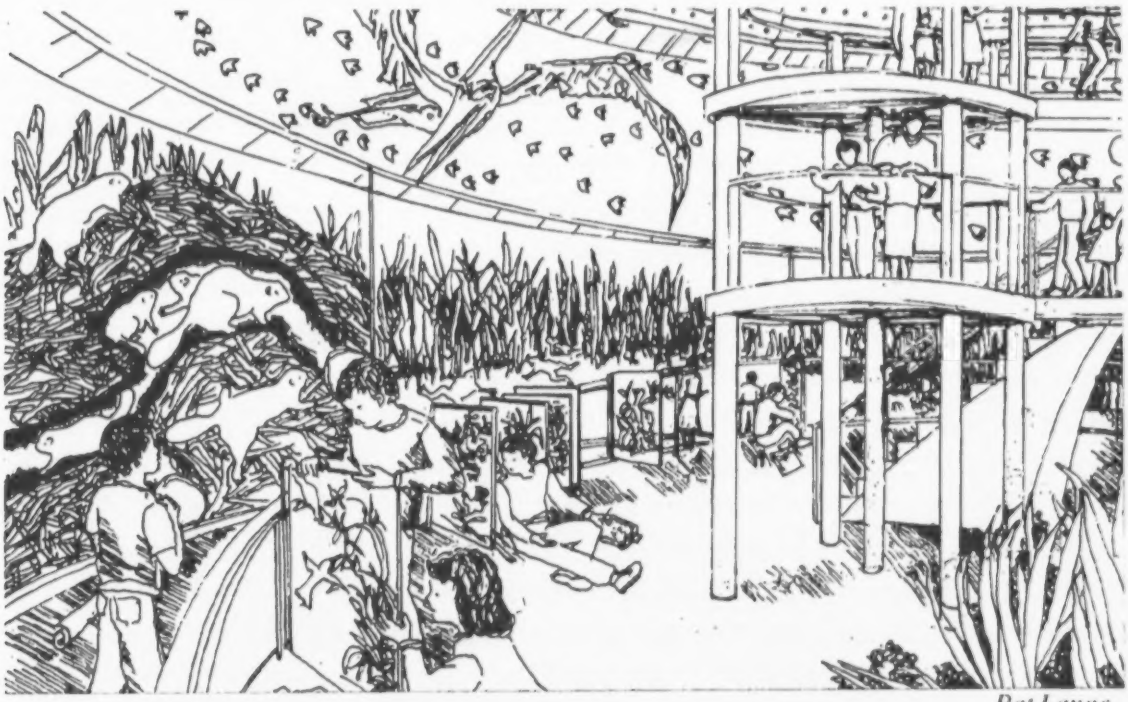
This, my friends, translates into diversity. Diversity means many links, many different approaches to the same problem. So a diverse community is a resilient community. A diverse community is one that can adapt to changing situations, and therefore diversity is another very important principle of ecology.

Now, we have to be careful when we talk about diversity, because we all know it's politically correct to celebrate diversity and to say it's a great advantage. But it's not always a great advantage, and this is what we can learn from ecosystems. Diversity is a strategic advantage for a community if, and only if, there is a vibrant network of relationships, if there is a free flow of information through all the links of the network. Then diversity is a tremendous strategic advantage. However, if there is fragmentation, if there are subgroups in the network or individuals who are not really part of the network, then diversity can generate prejudice, it can generate friction, and as we know well from our inner cities, it can generate violence.

So diversity is great *if* the other principles of sustainable organization are fulfilled. If they are not, diversity is a hindrance. We need to see that very clearly. If we have a network structure with feedback loops, and if different kinds of people make different mistakes, and if information about these different kinds of mistakes is shared and travels through the network, then very quickly the community will figure out the smartest ways to

solve certain problems or the smartest ways to adapt to changes. All the research about diverse learning styles and diverse intelligences will be extremely useful if—and only if—there is a vibrant community where you have interdependence, a vibrant network of relationships, and cyclical flows of energy and information. When the flows are restricted, you create suspicion and distrust, and diversity is a hindrance. But when the flows are open, diversity is a great advantage. In an ecosystem, of course, all doors are always open. Everything exchanges energy, matter, and information with everything else, so diversity is one of the key strategies of nature for survival and for evolution.

So these are some of the basic principles of ecology—interdependence, recycling, partnership, flexibility, diversity, and, as a consequence of all these, sustainability. As our century comes to a close and we go toward the beginning of a new millennium, the survival of humanity will depend on our ecological literacy, on our ability to understand these principles of ecology and live accordingly.



Pat Lange

The Role of Designers in "Design in Education"

Peter Edward Lowe
Phillip I. Nobel

Worldesign is an international organization that embraces all design disciplines. Our mission is to help bring the benefits of "design thinking"—the innate thought processes used to solve complex material problems —to the widest possible audience. To this end, for the last three years we have focused on finding ways to promote the place of design in K-12 education. Although some of our members are educators, most of us are designers who had to learn quickly about the important steps already being taken by educators to incorporate design into the curriculum. What follows is an overview of what we have discovered, and a proposal for a way in which designers can contribute the dynamic new field of Design in Education.

What is Design in Education?

At its most basic level, Design in Education is an effort to encourage learning through projects that demand the use of design thinking. Projects that involve complex two- or three-dimensional problem-solving introduce students to their too-often dormant ability to design. These projects do not have to mimic the practices of the traditional design professions. The goal of Design in Education is not to have children see themselves as professional designers, but to have all children begin to see themselves as agents of action and change. The trick is to make the kids the masters of any project they survey, in or out of school.

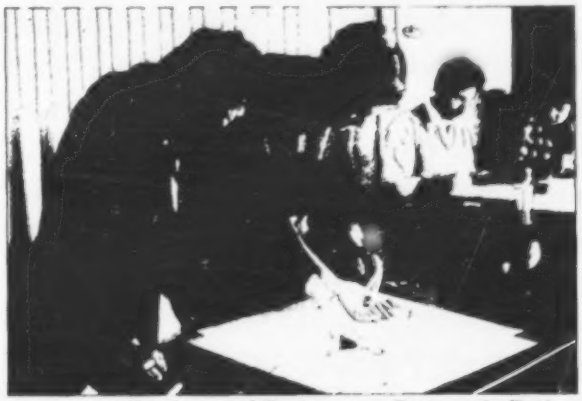
The term Design in Education can be used to describe a variety of innovative approaches to general (K-12) education that are currently being developed in many countries around the world. What these educational initiatives share in varying degrees is the conviction that design thinking can become a powerful vehicle to promote learning across the curriculum. Meredith Davis, one of the leading practitioners of design in Education in the United States, has defined Design in Education as "the study of design as a mode of inquiry that reaches a variety of learning styles and makes direct connections between school subjects and solving problems in everyday life." By teaching children to use their native ability to design, these programs aim to encourage a dynamic kind of intelligence. Confronting open-ended problems gives children the opportunity to creatively synthesize lessons learned throughout their studies. What results are students who have the flexibility, confidence and know-how to solve real-world problems, collaboratively and by themselves.

Hosada

Designers of every kind should be enthusiastic about this movement. Since we are all familiar with the use of design thinking —testing a problem through trial and error; finding that precious "aha" moment when an answer shows itself; guiding the idea through the long, rigorous process of refinement — we know instinctively how powerful design can be. We welcome the thought that children should become adept at this process, and many of us are also eager to teach it to them. But there are many problems at the levels of teacher training, curriculum development, community support, and financial and political backing that need to be resolved before Design in Education will become as widely accepted as we would wish.

Worldesign has been working with educators to determine how exactly designers can participate in De-

sign in Education. In an emerging field still dominated by traditionally trained teachers who sometimes have little experience in or feel for design, we want to know what will be the best way for designers to contribute in the classroom. It is our contention that at least part of the solution to the problems listed above will be found in the carefully considered participation of designers at many levels of Design in Education. Designers can help and our help is needed. The purpose of this paper is to begin the process of defining where designers' input will be most effective, and to encourage designers to establish and maintain active roles in Design Education.



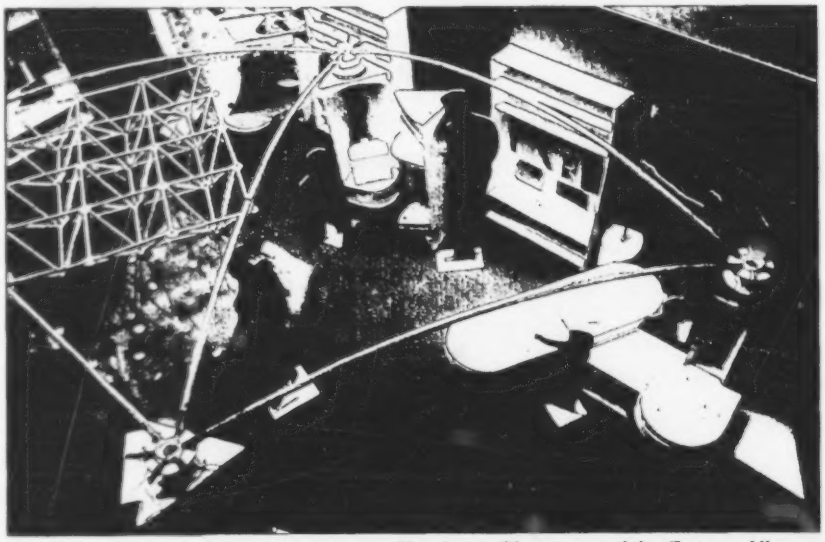
Teachers and Designers as Partners in Design

Variations on Design in Education Around the World

By our count, Design in Education is currently being practiced at some scale in over a dozen countries. Currently, England, Australia, New Zealand and The Netherlands have each changed or are changing their national curriculum to include the teaching of design thinking in some form as part of a long-term strategy to nurture an innovative society. In order to better understand Design in Education as it currently exists, it is important to first examine the three different methodologies that are currently being taught: technology education, design-based learning, and project-based learning.

Technology Education: Knowing how to make good products

Technology Education, not to be confused with Educational Technology — another new field concerned with computers in education — is an increasingly sophisticated version of what we used to call industrial arts, vocational ed. or "shop". Outside of the United States, where it has grown most popular over the last few years, it is also known as Design and Technology or, more commonly, "D&T". Technology Education derives its sophistication from an emphasis on real-world classroom technology projects enhanced by the use of design to help solve problems. In a technology education project, students are typically given a design brief outlining a technological problem, say the design of a go-kart, a coin sorter, or an article of clothing. They are then encouraged to create a solution limited by the tools and materials at hand. Unfortunately, in too many cases, technology education emphasizes vocational or technical skills at the expense of encouraging creativity.



Headstart Classroom of the Future, Vlastos

But this is changing: the current trend is towards a greater understanding and acceptance of design. The largest example of this is in England where all children from Kindergarten through the tenth year spend 10% of their time in the classroom designing and making things. Not only does this activity occur in all schools but in many cases it is used as a cross-curricular approach that gives students the opportunity to use and apply their skills and understanding from the programs of study for all subjects, includ-

ing, where appropriate, art, mathematics, social studies and science. What is extraordinary is that throughout technology education, hundreds of thousands of children are also getting an invaluable first exposure to the power of design thinking.

Project-Based Learning: Solving problems by working on projects

The programs in this area are typically developed by science and math teachers, and they tend to be rich in technical material. Projects can range from the simple — re-imagining the three little pigs house to withstand the wolf's attempts to blow it down — to the highly complex. A high school in Michigan has an ongoing program where the students build and maintain the school's solar and wind power generation systems.

Like the other Design in Education initiatives, project-based learning suggest strategies for teaching complex subjects through hands-on projects. One emphasis is on hands-on work as a way to raise the interest levels of students, what Joe Oakey, the president of the Autodesk Foundation, a major proponent of project-based learning, has called "sneaky teaching." By working out solutions for themselves, students learn more without realizing it. But project-based learning differs from both design and technology and design-based learning by ignoring design thinking. Design thinking plays a part in the successful completion of these projects, but it is not called out and celebrated as it is in the other methods. Still, Design in Education, as a synthesis of these three strains, owes a debt to project-based learning for its advocacy of active, hands-on problem-solving exercises in the classroom.

Design-Based Learning: Knowing how to use design thinking in everyday applications

There are also many individually sponsored Design in Education initiatives taking place all over the world. These diverse programs, which can be described under the rubric Design-Based Learning, are typically localized, experimental projects conceived by educators with experience in architecture, the arts or design. They are generally confined to one district, one school, or even one class, and they tend to emphasize the more humanistic and artistic side of design. For many designers, this is the methodology they will find most appealing. One example in the United States is Doreen Nelson's City Building curriculum, which has been implemented in over forty universities, museums, and school districts since 1969. In this program of study, students are assigned the responsibilities of real life city-shapers collaborating on the design of a futuristic city. Along the way, they are forced to solve a myriad of unforeseen problems, including the thorny and rewarding task of communicating their discoveries.

Other examples of Design-Based Learning projects abound. Teachers have fashioned design projects around everything from building abstract models of governmental systems to designing Rube Goldberg machines that perform a set task with limited materials. Other classroom-tested design projects include comparing the traction of different sneaker soles on an inclined plane and then using this data to design improved models, and exploring and documenting a neighborhood through maps, models and the written word. In these projects, the subject matter — comparing world governments, for instance — can be equivalent to a traditional classroom's, but the method in which it is taught — arranging paper forms to express hierarchies and connections — allows students to explore and experiment with multiple solutions through the design process, rather than accepting answers as given. In the end, this process

Young children using light tables, Taylor

leads to a better, more critical understanding of the subject, whatever it may be.

While Design and Technology programs tend to emphasize vocational skills, Design-Based Learning programs are less concerned with technique and more concerned with developing creative thinking. There is a place for the designer in each type of program. Design-Based Learning curriculums offer the most fertile environment for a practicing designer to intervene — it is there that the intricacies of design thinking are more often explored, and, consequently, the place where a designer's shared experience will be the most valuable — but their small scale and fragmented organization mean that a tremendous organizational effort may be required before results are seen in the classroom. On the other hand, while technology education programs tend to overlook the importance of design, they have the advantage of already being associated with strong, centrally-organized advocacy groups such as the International Technology Education Association and the Design and Technology Association. Designers working with these groups could help to set an agenda for improving the training of technology teachers in design thinking.

Hosada

Some Problems for the implementation of Design in Education

Designers are likely to become more enthusiastic about Design in Education as they learn more about it. But it is very important that we temper this enthusiasm with a measured appraisal of some of the stumbling blocks that currently face the movement. Outlining these problems will also help to suggest roles for designers that are respectful of teachers.

Doreen Nelson has written that "teachers are the architects of the classroom."
This statement can be read as both a warning and an invitation to designers: respect the limits of your professional expertise — don't try to "design" Design in Education — but work with teachers so that they can become better "architects" in their classrooms. This points to the central problem related to teachers of Design in Education. Except for the special few who can straddle the worlds of education and design, most teachers will be relying on a book-learned knowledge of design. In many situations, such a theoretical knowledge of design principles and processes may suffice. But in difficult cases — when a child has become hung up in the design process or is confused about finding a way into a problem — the "street-tested" knowledge of design that a practicing designer develops could be invaluable. This suggests that a fruitful role for designers might be as a sort of expert mentor in the classroom, working with the teacher during the planning of a project and coming to the fore when the students need help with the *process* of design.

Designers in this mentor role would also be responsible for a maintaining the presence of a crucial factor in the design process: intuition. A teacher might have read about the wonders of letting the mind of a child follow small clues and inklings to reach new solutions, but a designer's personal experience in trusting one's intuition can be translated into a powerfully convincing message. There is a point after the analysis of a problem where the mind is filled with facts-the height of the sun, the slope of a plane, the length of an arm-but they are not yet ordered. This is really the heart of the design process, the pause before the lightning strikes. The ability to trust sub-conscious cues, to grope blindly but intelligently towards something new, is crucial to finding a solution to the problem from this point, which can seem overwhelming and confusing to those that do not trust their abilities or the process. Inspiring children to appreciate the power and importance of this mode of thinking-and giving them the confidence to carry on through moments when solutions seem distant or impossible-may be the most important contribution that designers can make to the success of Design in Education.

Designers can also act as mentors to groups of teachers, helping to reinforce the understanding of design thinking at the level of teacher training. This

can take place both within an academic program of study and in less formal post-graduate workshops. Currently, there are few schools in the country offering a graduate program of studies in design-based education, so the workshop approach to training teachers is still the most fruitful. One such program is the "Architecture-in-the-Schools" program of the New York Chapter of the American Institute of Architects (AIA). This group conducts workshops where teachers learn about design and designers learn about teaching prior to leading classes on architecture in the New York public schools. Architects have also taken the lead in the development of instructional materials. For instance, the Architecture and Children program, created by Anne Taylor with the AIA's Learning by Design program, has produced a complete curriculum which provides "a phantasmagoria of architectural experiences for children." Architecture and Children introduces students to a wide range of concepts through the study of architectural form, history and drawing conventions.

Designers are also uniquely positioned to help bridge the gap between schools and the world of work. Designers know about the concerns of leaders in business. We can understand their language, and the language of teachers, so we are well-qualified to act as liaisons between schools and corporations, which too often do not understand the intentions of the other party. Design defines products and services, it is the life-blood of all companies, whether at the scale of industrial design, architecture, or city planning. Company presidents know this. They realize that a creative, design-wise workforce can put them at a great advantage. Designers can help to spread this message, and perhaps help to arrange pro-active public/private partnerships in the schools. In this way, an important facet of Design in Education, its ability to contribute to making a creative, conscientious, and independent workforce, will not be lost.

Another possible role for designers relies more on the ability to synthesize and organize information than on an intimate knowledge of design thinking. While we suggested above that it would be inappropriate for designers to "design" the curriculum, it may make sense for designers to take on the responsibility of organizing Design in Education initiatives at the level of the school, the community, and the state in effect, designing the movement. This is the place where it seems that educators are most in need of allies, and it is also the place where a designer's project management skills can be best applied.

But designers should not enter naively into this role. We need to be aware of the concerns of other groups who may resist Design in Education for a variety of reasons. Any proposed changes in education will have opponents, and the current political climate is likely to foster even more of such opposition. People are understandably skeptical of "newfangled" educational initiatives, particularly those that smack of estheticism. Why should American children spend time designing when statistics reveal such a crisis in learning basic skills? The key to defusing such criticism may lie in positioning Design in Education as a sort of middle ground between the arts and the sciences-a way of making the arts "useful", if you will and by stressing that using design in the classroom is itself a powerful tool to teach basic skills. Even a simple design problem will require students to use math and language skills in a surprisingly sophisticated way as they develop and explain their ideas. This line of reasoning might also help to explain the objectives to policy makers, especially if a connection can be made to the way that other countries are using design and technology education to foster competition in the global marketplace.

Defining roles for designers in education will not be a simple matter. The possible roles and strategies that we have suggested here are only at the beginning of what, we hope, will become a very long list. Still, it is important to remember that in complex interactions among teachers who are new to design, administrators who may be unconvinced about the efficacy of Design in Education, and educational theorists who might prefer their abstract models of design to the gritty truth, the over-zealous designer risks becoming an irritant. With no expertise or background in teaching or curriculum development, even the best-intentioned designer would probably do more harm than good without guidance from someone versed in the intricacies of age-appropriate educational techniques. But by identifying roles in which the designer's abilities complement the teacher's, we will have taken a step towards preventing the kind of "turf" battles that could hobble Design in Education.

Physical Environments Do Affect Learning and Behavior of Students

Anne Taylor Ph.D., Honorary A.I.A.

The physical environment of our schools does affect learning and behavior. **Developmental needs and curricular goals,** concepts and principles to be learned, seldom have been used by educators and architects in determining learning environment design. Instead, educational specifications, given to architects by educators, are made up of pre-determined square footage and activity setting needs which for the 21st century about to begin, are obsolete in concept and meaningful reality.

The large body of research on the current need for restructuring education, cognitive development of children, learning and even teaching has largely ignored the extent to which learners' surroundings affect perceptual learning, concept formation, language development, socialization, creative-aesthetic growth, attitude toward schools, reduction of vandalism and attrition rates in schools and processes and practices needed for the 21st century.

It is not enough to identify that the United States needs more schools. It is not enough to build and construct more schools, especially if they continue to be designed as egg crate cartons with obsolete classrooms positioned off a double loaded corridor! It is not enough to be concerned about better roofs, windows, doors, walls, HVAC systems, fences and landscaping for schools. It is the way these elements are put together in a meaningful and symbolic sense of place and community which is important.

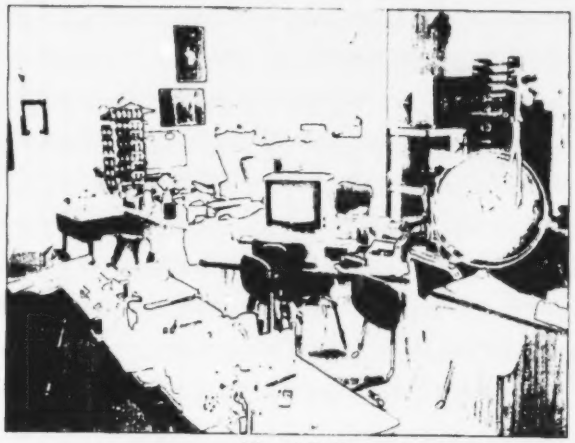
It is the rationale of environment as support system to learning that we need to investigate. The need for better school design has gone way beyond the days of arguing over whether or not we should have windowless classrooms, or whether portable classrooms are a solution to additional space needs for burgeoning school populations. Our learning environment needs for the 21st century demand a whole

Exhibition, Architecture for Children , Vlastos

new way of looking at the process of programming and design, one that is not based on past history, but on futurist thinking and a willingness to push the boundaries of ambiguity.

The purpose of this article is twofold:

1. To examine selected research already done on the effects of environment and environmental elements on learning and behavior in order to derive design information for future school building and to assess needs for additional research in school design and building.



Visual Pollution in the Classroom

2. To examine a process of collaborative architectural programming which replaces traditional educational specifications given to an architect by local school officials.

We need to do a "frontal lobotomy" on all school designers, go to ground zero and begin again with a process that examines the multi-sensory needs of the client (the student) and transforms learning environment architecture into a "three dimensional textbook", a museum-like environment where students learn from both the built and the natural environment, and take responsibility for their own learning, an environment where schools are places for all the community to learn, housing perhaps a day care center, a community library, a museum, technology studios, cooking and nutrition classes, perhaps even growing food in gardens and greenhouses. Some futurists say that sustainability and stewardship of the planet should be at the core of the curriculum before all else is taught, thus making the design of a qualitative learning environment essential. (Capra, 1995)

Environment does affect learning

An early experimental study in 1971, and replication of the study with non-English speaking children in 1972, created an environment for four year olds based on the elements of design; color, line, form, space and texture.

The experimental environment consisted of four portable environments including the "organic, soft, geometric and mirrored environments. They were created to be non-literal and more "architectonic" in design than most early childhood environments. Toys consisted of non-literal building manipulatives and art materials for designing as well as an artifact mini-museum of cultural realia, to foster the making of critical aesthetic judgments. Results demonstrated that the overall aesthetic quality of children's art products and tempera paintings could be attributed to a prepared environment and a multi-sensory organizing and cognition system for using objects within the environment. Concept formation also increased significantly in the experimental environment as compared with the control group. (Taylor, 1971).

Wolff Lang Christopher

In a subsequent replication study sponsored by-the Southwest Cooperative Educational Laboratory (NIE), non-English speaking children moved more rapidly from parallel play to integrated play. Their acquisition of English was more rapid and more statistically significant in gain than an English as a second language program employed by the lab. (Taylor, 1972) In a study with Native American students in a boarding school, student involvement in the environmental modification and improvement of the school, reduced the

attrition and vandalism rate to zero. (Taylor, 1978)

Design Patterns for Schools

Gary Moore, Director of the Center for Architecture and Urban Planning Research, University of Wisconsin-Milwaukee and his staff have reviewed empirical literature about the impact of the designed environment on educational performance. They also looked at architectural literature and education reform literature. He asked questions such as the following:

> "Does the designed environment affect educational performance? How will shared decision making affect the physical layout of classrooms and whole school buildings? What are the implications of new forms of assessment such as portfolios, on the use of classroom space? How will the process of furthering teacher professionalization affect the privacy needs of teachers? Are findings from the empirical literature reflected in recent design trends?"

Answers to these questions helped Moore and his staff to create 27 design patterns that respond to current reforms. Of the 27 a few of the following emerged as important to school design.

Smaller Schools are Better

Between 1960 and 1980, 344 articles were published pertaining to the effects of school size on academic achievement. Barker and Gump (1964) and Barbarino (1980) concluded after studying many large and small schools, that small schools provide opportunities to participate in extracurricular activities and exercise leadership roles. Students participate in more social and community activities and take more classes. In smaller schools there is a lower incidence of crime and less serious student misconduct.

Fowler (1992) stated that the effects of school size at the elementary level seem conclusive based upon findings that (1) there is a negative relationship between math and verbal test scores and school size, (2) larger elementary schools are detrimental to student achievement, (3) smaller schools are particularly beneficial to African American student achievement, (4) the negative relationship between school size and school performance is most prevalent in urban schools. Glass and his associates (1982) found that students' scores on achievement tests yielded a gain of 6 percentage points when classes were reduced from 30 to 20 students, and 13 percentage points when lowered from 20 to 10 persons. His recommendation was 15 students per class. Governor Pete Wilson of California recently reduced the required class size for young children to 20 students.

The School As Community Center

No empirical research was found by Moore on community schools, but reform commentators suggest turning schools into community centers so even people without children can use them. In Trout Lake, Washington the district had been trying to pass a bond issue for five years. Both parents and their children wanted a community center with a day care center, gym and auditorium for community use, and a nutrition and cooking area for community classes. The superintendent and architect honored their wishes. By involving students and their parents in the research, programming, environmental impact studies, data collection and the design process, a bond issue, which hadn't passed in five years, passed in one month after a student architectural exhibition and parent meeting was held at the school. (Taylor 1994). In Stockton, California, a community school will become a farm and environmental study center as an alternative high school, based on student input and

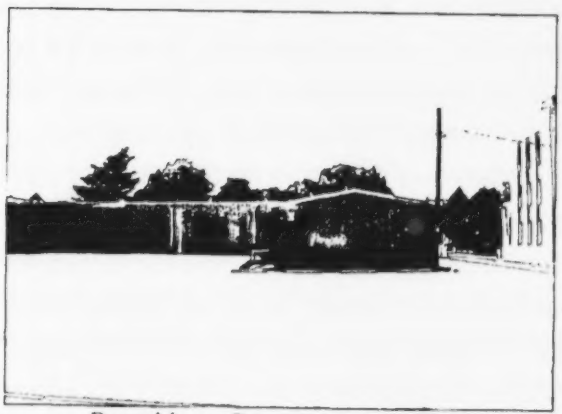
unique design ideas from students during the programming process. Wolff, Lang, Christopher (1996)

Students and Teachers in a Family Setting

Instructional spaces or suites can be clustered around shared support services including lounges, computer hubs, office space for teachers, lockers, bathrooms, display cases and seminar rooms. This is not a new idea in contemporary school design.

The Classroom as a Design Studio

Taylor (1997) has advocated that classrooms mimic the architectural design studio, to better support constructivist, project oriented curriculum and instruction, which is based on multiple expressions and intelligences. The studio provides each student with a work station (including a laptop computer), a visual-verbal portfolio storage place, floor to ceiling display gallery with pin up space for critiques, a small conferencing area for collaboration and a video studio. All furniture and equipment should be on wheels with brakes and be deployable and flexible for multiple configurations.



Portable on Barren Asphalt Playground

Studio of the Future - Learnscapes™

Creative Learning Systems from San Diego is creating new kinds of technology learning environments which act as studios and technology labs from which children learn in an integrated way at their own speed in a studio-like, applied learning format . Unlike the common school classroom setting, a creative Learning Plaza is a large open environment for up to 150 people, working together for several hours at a stretch. In the Plaza, learning is project-based rather than subject-based, so session duration is determined by the scope of the projects. Rolling stock benching, stools and chairs create an integrated system of furnishings modular and inter–connectable for interrelated configurations. Collaboration coves, a video and architectural design studio, multi-media centers, and wind tunnels for testing created models allow students to study robotics, computer aided manufacturing, systems simulations, satellite technology, pneumatic structures, rocketry, aerodynamic testing, simulated flight, hydroponics, super-conductivity, space frame construction and computer assisted publishing. Students are largely responsible for their own learning. Facilitators roam and orchestrate learning. Architecturally, a large 6000 sq. foot space with properly wired space from the ceiling, is all that is necessary and can be housed in new or renovated facilities. (Creative Learning Systems, 1996)

Professional Workspaces for teachers

Teachers too, need a more professional environment in which to work, one which supports, more than minimally, what they do. Carnegie Foundation (1988) discovered that most teachers found working conditions unsatisfactory. Shared decision making and being a professional requires a private working space (including telephones, fax machines, computer terminals, and internet, connec-

Inappropriate Technology Environment

tions), possible in clusters of teachers offices adjacent to learning environments.

Other research and needs for research

The above studies speak to reconfiguration of classrooms and learning spaces, but there are other factors which need further research.

Noise levels

Poor auditory discrimination and less tolerance for frustration by children in noisy environments reduces and adversely affects learning and teaching time (Cohen and Weinstein 1981). There is a need to study sound attenuation in schools, especially in cafeterias and hallways.

Natural Light and Lighting

For many years architects were told to design classrooms without windows to save energy, reduce vandalism and to "allow students to concentrate" without their eyes wandering to the outside as a distraction. The author has noted that even where schools have magnificent views of the landscape, especially in the West, many schools have been and are still being constructed without windows. The effect of the quality of light in the learning environment has to do with more than vision. Positive physiological and behavioral effects of full-spectrum versus fluorescent lighting have been demonstrated by Ott (1975). Hathaway (1987) noted the ill effects of poor lighting on neuroendrocrine functions hyperactivity, health and on-task behaviors. Recent improvements in lighting technology, such as day lighting and "smart" sensors, halogen and "up lighting," have shown reduced energy costs and student performance improvement.

Furniture and Equipment

Taylor and Vlastos (1994) devised ergonomically scaled moveable furniture for the Headstart Classroom of the Future which consisted of deployable, flexible multi-sensory pavilions, including a Hearth (cooking environment), Media Center, The Garden, The Nest (soft area), the Showcase (mirrored) the Frame (spatial relationship) Design Studio (art workshop and construction). Most school furniture gets in the way of teaching and learning, is not moveable, too heavy, cheaply made in some cases, not ergonomically correct and detrimental for student posture and eventually student physical health. Much work needs to be done by furniture companies in tandem with sensitive designers to move the state of the art of school furniture design into the 21st century.

The Study of Activity Settings and the need for improvement in design

Areas of schools which need to be studied and improved included the following:

Entryways to schools

Circular driveways, trees, the entryway itself must be more user friendly. Now formidable signs warn the visitor in many schools "NO SMOKING" and "NO GUNS." In some schools in St. Louis one must ring a doorbell before one is admitted to the school. Whether the American public knows it or not, our schools in many cases, are being run more like prisons with gates, locks, chain link fencing and ever

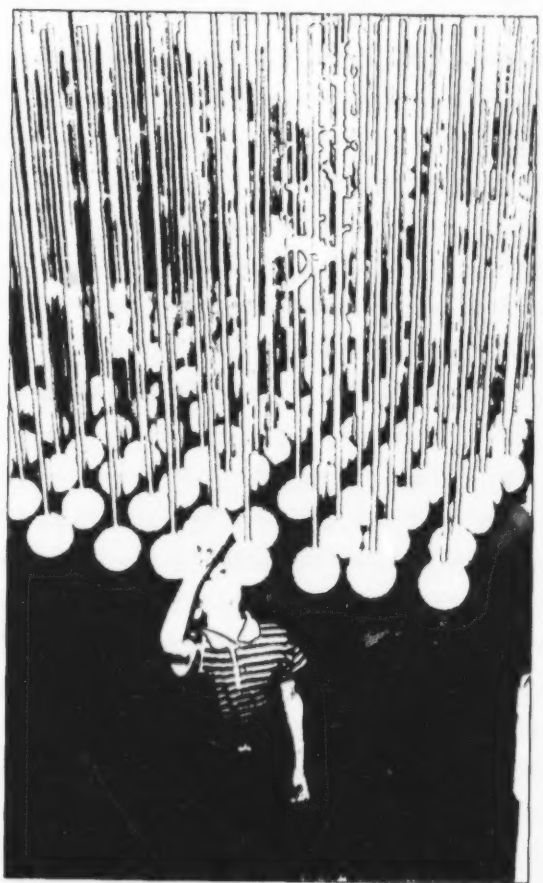
guard dogs and on-site security persons. Somehow, we need to turn the image toward a more positive way to gain admittance to a public building. We need to design for democracy instead of a "police state."

Mud Rooms and coat storage

In schools where there is inclement weather and a plethora of snow, rain and mud, a mud room where dirty shoes or boots are exchanged for slipper socks or "school shoes" will keep the school much cleaner. We need to rethink coat storage beyond "hooks", as most student clothing ends up in a pile on the floor.

Hallways

Lockers in the halls can be replaced by museums, plants, graphics and educational display. In Japan, hallways are wide, open and airy in many schools and can be used as explosive places for learning.



Exhibition as math learning environment.

Color

The research on the effects of color is inconclusive and does not address ethnic preference. Some studies have demonstrated the influence of color on blood pressure and behavior (Sydoriak, 1984) on mood, psychomotor performance, muscular activity, rate of breathing and pulse and blood pressure (Plack and Shick, 1974.) Some research has studied the effects of "bubble gum pink" in reducing violence among prisoners in jails. In Waldorf, schools which base some of their teaching methodology on theories of Rudoph Steiner and Goethe's color theory, there is use of pastel instead of bright colors for young children. Waldorf educators believe the rods and cones of the eyes of children are not fully formed enough to see bright reds, yellows, blues and greens usually found in preschools, and considered by adults to be the best colors for young children in clothes, toys and room accent colors. There is a need to do further research on color and its effects, on learning and behavior.

Display and portfolio assessment

Bulletin boards are obsolete. Floor to ceiling celotex or homosote should be used throughout the school for pin up, critiques and display. Special frames for art work can be designed for hallways and classrooms to meet fire code specifications. Portfolios can include evidence of any one of the multiple intelligences including dance, kinesthetics, acting, music. In this case, areas for individual or small group performance assessment and creative self expression should be disbursed throughout the schools. Places for performance assessment need to be researched by designers in conjunction with educators.

Signage and circulation

In some school districts, over 72 languages are spoken. If literacy is a goal for all students, then signage must be a part of the navigational system in a school, especially if we expect more community members to inhabitant the schools. Visual graphics and signage systems can be painted by students with or without artist-mentors.

Early learning environments, Taylor

HVAC Systems

Ways to help children understand the sustaining operations of the school should be encouraged. Instead of mechanical and electrical consultants designing the systems, installation can be part of the programming process and they can be encouraged to design their systems in such a way that children can learn from them how a building works. Consultants can provide a users guide so the systems are explained to adults and students. Perhaps alternative systems can be built into the school to give students a chance to experience energy saving ways of building with solar power, wind generation and utilization of irrigation systems. A recent visit by the author, to a new and expensive high school in Washington State with extremely high hallway ceilings displayed a complete disregard for energy conservation.

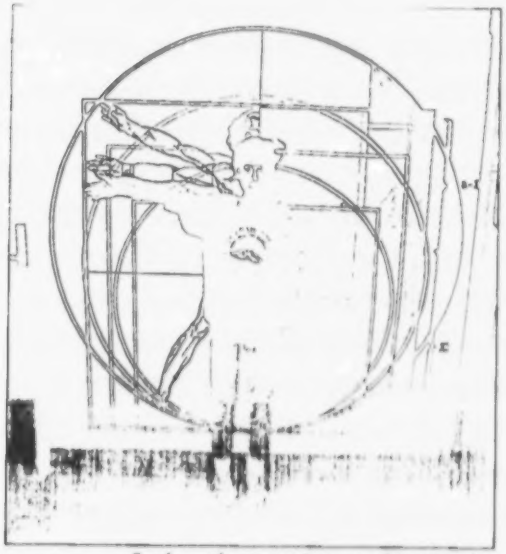
Playgrounds

Landscape designers can work with schools and city parks departments to conceptualize "learning landscapes." Nature trails can be combined with exercise courses. Botanical concepts can be taught with enriched landscape design. Ground graphics define new games. Even a computer or piano keyboard to enhance keyboarding skills and knowledge can be painted in large scale on the playground. Large and small gross motor development can be acquired in a variety of ways. Not all children want to play large team sports. Tennis courts, and ball fields of all kinds are already in place, but we need to think of enrichment and support to the curriculum. In one school in central Albuquerque, a park-playground was designed for community use. There is no chain link fence. There are no locks. The playground is open to the public. Children have a garden there and grow vegetables. As yet, there has been no vandalism, no crime and no stolen vegetables. The state superintendent of education in California wants a garden in every school which means 8000 new gardens for that state.

Standards for learning environments

Lastly it is the recommendation of this writer that The American Society of Testing and Materials (ASTM) be solicited to become more involved in developing guidelines for designing,

building and evaluating schools. ASTM sets standards for much of the construction industry and products used in the industry. They can help educators, architects and school administrators develop a system of design guidelines and evaluation standards for the restructuring and assessment of quality learning environments in this country. The point to remember is that we are not creating hospitals, banks or shopping centers. We are creating **learning environments.** Not only can teachers teach, but buildings and grounds and other physical resources within these environments can teach, if architects and their consultants offer visible manifestations of the logic behind their designs. In this way schools are optimally designed and the user- taxpayers have optimized their architectural investment for the whole community.



Scale and proportion graphic visuals

ARCHITECTURAL PROGRAMMING

Traditional "educational specifications" are obsolete

In Seattle, where 700 million dollars is needed to build and upgrade new schools, a facilities director hired one man to write one

Early Childhood Environment- Taylor

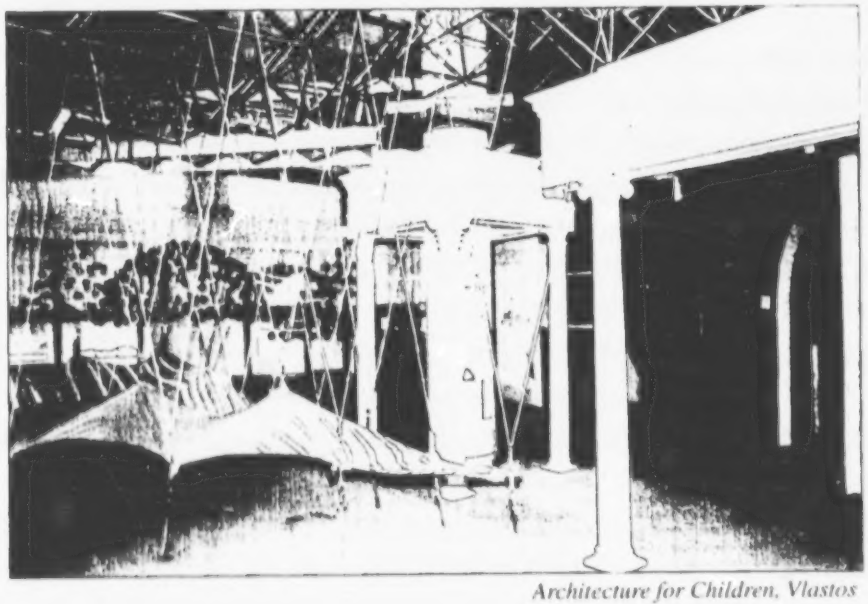
architectural program for over 50 schools to be built or renovated. The former superintendent told me that he knew that resulting schools would be 15 years old in concept before they were even built and he didn't know what could be done about it! This is an irresponsible waste of taxpayers money, many of whom are not voting to pass needed bond issues because they don't trust the planning and implementation process. In this case it is justified. In some cases local Seattle school planning committees have been formed to articulate neighborhood needs, but the educational and architectural planning and programming is already in place, so their input is piecemeal conceptualization "after the fact".

Maslow's levels of human functioning translated into Architectural Habitability Levels

It is possible to look at levels of human functioning and translate them into habitability levels which include the **Health and Safety,**

Functional and Psychological Comfort and Aesthetic Satisfaction. For the most part, school buildings meet health and safety codes, although some of the latest data show otherwise. But functionally, schools do not support the new curriculum or restructured goals and benchmarks nor are they psychologically comfortable or aesthetically pleasing. Even our new schools are too institutional. A model of architectural programming which includes design criteria from the curriculum and developmental needs of students and the community is richer in concept than predetermined square footage needs.

Instead of looking backward historically and repeating our past mistakes in school facilities, designers and educators must collaborate and cherish the creativity found in providing support for education and community learning environments of the future. It is not the bricks, concrete and mortar we are supporting it is the antecedent thinking among architects, educators, students and community that will help to build better architectural support systems for real life learning in the 21st century.



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